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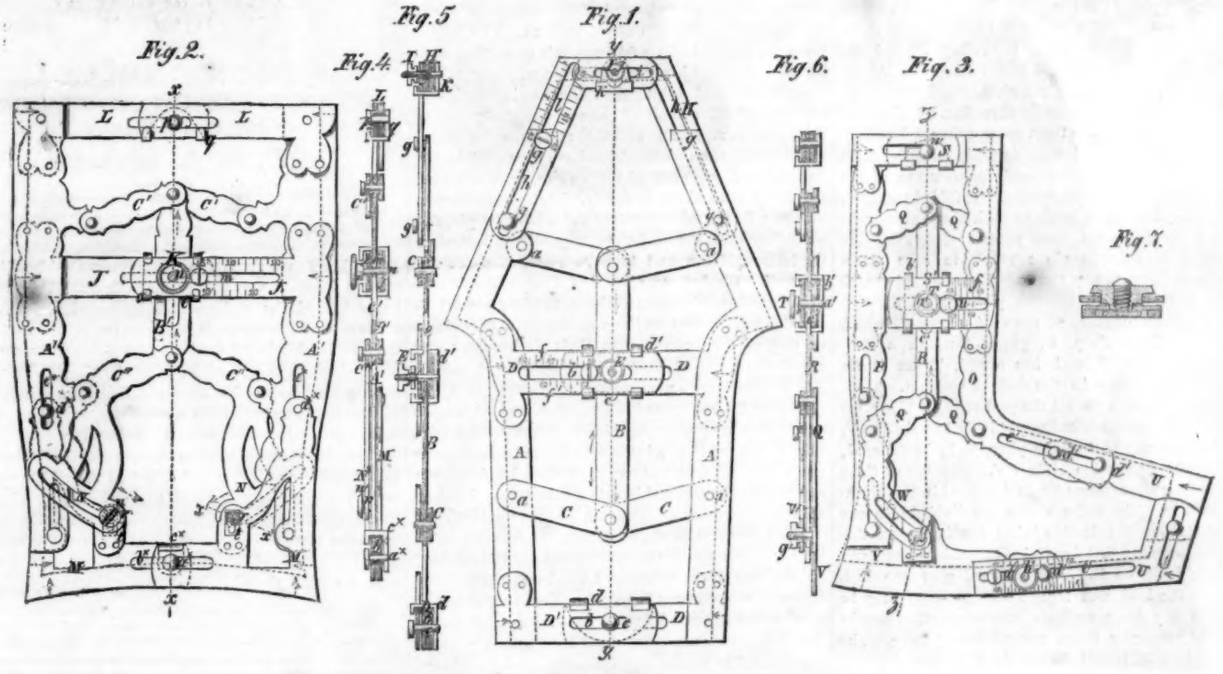
Improvement in Boot Patterns.

The millions of pairs of boots that are made annually require a vast amount of labor in cutting the leather in pieces of the proper forms. Manufacturers supply themselves with patterns of the several pieces entering into the construction of a boot, each size of boot of course requiring a separate set of patterns. Patterns have, however, been invented, in which the several parts were connected together by means of slides and pivots in such manner that the size of the pattern could be readily adjusted for a boot of any size, thus rendering a single set of patterns sufficient for a manufactory.



FORRIST AND WHEELER'S BOOT PATTERNS.

The accompanying engravings illustrate an improvement in this class of patterns, invented by Asa Forrist and C. A. Wheeler; the invention having been assigned to the inventors and W. H. Goudy and Henry Rogers, all of Mount Vernon, Iowa. The object of the invention is to obtain a set of patterns which may be more readily adjusted, and in a more exact manner, than those previously constructed and arranged, and also readily adapted for cutting out stock for both coarse and fine boots.

Fig. 1 is a face view of the blocking pattern; Fig. 2 a face view of the back pattern; Fig. 3 a face view of the front pattern; Fig. 4 a section of Fig. 2, taken in the line, $x\,x$; Fig. 5 a section of Fig. 1, taken in the line, $y\,y$; Fig. 6 a section of Fig. 3, taken in the line, $z\,z$, and Fig. 7 a section of Fig. 2, taken in the line, $x'\,x'$. Similar letters of reference indicate corresponding parts in the several figures.

A A (Fig. 1) represent the two side pieces of the blocking pattern, the outer edges of which are made of a shape corresponding to any desired form for the front of a boot previous to crimping. The form of the inner edges of the side pieces is immaterial, so long as the interior of the pattern is left sufficiently open to enable the operator to see as much as possible of the leather included within the pattern, and thereby enable him to cut the stock economically and judiciously, and so as to avoid blemishes and imperfections, which would injure the manufactured article. B is a sliding strip which connects parallel arms, C C C C, said strip being movable in the direction indicated by the arrows. The arms, C, are attached to the side pieces, A A, by pivots, *a*, to keep the side pieces parallel with each other, as the pattern is expanded or contracted to the required size. D D D' D', are traverse pieces, which are riveted to the side pieces, as shown at *a*. These traverse pieces overlap and extend the whole width of the pattern, when the latter is contracted to its smallest size, and they have slots, *b*, cut in them longitudinally; and through the slots of D', a button or pin, *c*, passes, said button or pin being riveted in a clasp, *d*, for the purpose of holding the pattern together at the top, and at the same time allow an easy contraction and expansion of the same. E is a nut which is fitted on a screw that passes through the slots, *b*, of the traverse pieces, D D, and also through a slot, *e*, in the sliding strip, B, said screw being riveted in a clasp, *d'*, which embraces the traverse pieces, D D. By means of this nut, E, the pattern is fastened or secured, when adjusted, as desired. On one of the traverse pieces, D, two scales, *f f'*, are made as guides for adjusting the pattern. These scales, *f f'*, are numbered according to one-half of the heel measure—one half of such measurement being indicated on this, and the other half on the back pattern, hereinafter described—so that when the pieces, D, are set to the number 10, for instance, and the back pattern to the same number, the two parts of a boot may be cut from said patterns, which, when made up, will be ten inches through the heel. The scale, *f*, is for fine, and the scale, *f'*, for coarse boots, it being proper to make that difference in the size of the heel and leg, while the instep is the same in both cases, owing to the shank of the coarse boot being made wider across the bottom than the shank of a fine boot. H H are adjustable toe pieces, which are movable in a longitudinal direction, independent of the other parts of the pattern, said toe pieces being kept parallel with the side pieces, A A, by buttons, *g*, passing through guide slots, *h*. The toe pieces, also, have guide slots, *i*, cut through them to allow them to expand laterally, a screw, *j*, passing through the latter-named slots, said screw being riveted in a clamp, *k*, and having a nut, I, upon it. The object of the independent adjustable toe pieces, H H, is to adapt the pattern to cutting any desired length of foot, with any given size of leg or heel. The scale shown at *l*, is numbered according to the divisions on the size stick. By means of the nut, I, the toe pieces, H, may be fastened or secured, when adjusted, as described.

The back pattern, shown in Figs. 2 and 4, has some parts which are common to the blocking pattern just described. The side pieces, A' A', are made to conform to any desired shape for cutting the back of a boot, but they are made as narrow as possible to economise in material. C' C' C'' C'' are arms, pivoted to the side pieces, A', and connected at their inner ends to a sliding strip, B', which has a longitudinal slot, *s'*, made in it, through which and slots, *m m*, in traverse pieces, J J, a screw passes; said screw being riveted in a clasp, *o'*, and having a nut, K, placed on it for fastening the pattern, when adjusted, as desired. The side pieces, A' A', are connected at one end by traverse pieces, L L, which are slotted longitudinally, and have

a button or pin, *p*, fitted in the slots, said button or pin being riveted in a clasp, *q*.

The parts above described as forming portions of the back measure, correspond to those described in the blocking pattern. The following described parts, however, are different :—

M M are movable counter pieces, which are made to extend automatically, by means of slotted cams, N N, which may be described as being continuations of the pair of arms, C″ C″. These cams, N, are fitted on bolts, *r*, attached to the counter pieces. The object of these counter pieces is to lengthen the spring in the side seams, proportionably as the patterns are enlarged, through the heel and leg, thereby retaining the proper shape through all the different sizes. The bolts, *r*, are movable or adjustable in short slots, *t*, and are secured in their places by nuts, *u*. The nuts are constructed with a flange, as shown in Fig. 7, so that when the nuts are tightened, to hold the nuts freely in their places, the cams can work freely on the bolts. The object of these movable bolts, *r r*, slots, *t t*, and nuts, *u*, is this, by loosening the bolts and then extending the patterns to 10, on the scale, *f*, the counter pieces will not be extended by the cams, N N, thus keeping the spring the same as though the change had not been made, which changes the proportion of the pattern so as to adapt it to a coarse boot. By again tightening the bolts, *r r*, the cams, N N, will throw down the counter pieces the same as before. These counter pieces are connected by a button, a°, working in slots, b°, the button being pivoted in a clasp, c°, and the counter pieces are connected to the side pieces, A′, by buttons, d°, working in slots, e°.

The front pattern, shown in Figs. 3 and 6, also contains parts common to the two previously-described patterns. The front piece, O, is made to conform, at its outer edge, to the front and instep curve of the leather, after it has been crimped and folded together, while the piece, P, is made in such shape as may be desired, to match the back pattern along the side seams, both being made narrow, to save material in making the patterns. The two pieces, O P, are provided with traverse pieces, S S′, through which buttons or pins, *w*, pass. A screw, a′, which is riveted in a clasp, *b′*, passes through a slot, *c′*, in the strip, R, and has a nut, T, on it for fastening the clamp in the desired position. These parts are common to all the patterns. U U are toe pieces, which are attached respectively to a shank, V, and to the lower part of the piece, O, by buttons, *d′*, passing through guide slots, *e′ e′*. The use of these toe pieces is the same as those described in the blocking pattern. The scales shown are divided into one fourth inches, the leather being doubled when this pattern is used. One-fourth inch on this pattern, and one-half inch on the back pattern, give one inch through the heel and leg. These patterns may be made to any shape, on their outer edges, that may be thought proper by those manufacturing them. The shank piece, V, it will be perceived, is moved downward automatically, by means of a slotted cam, W, working on an adjustable bolt, *g′*. The toe pieces, U U, may be also adjusted independently of the pieces, O P, and are fastened by a nut, *h′*.

The patent for this invention was granted through the Scientific American Patent Agency, Sept. 24, 1861.

The territorial rights are owned as follows, and any person wanting the manufactured article, or the right to make, use, or sell, in any of the States named, will please address the owner accordingly :—

California, Oregon, Pennsylvania, Ohio, New Jersey, Delaware, North Carolina, Washington Territory, Utah Territory, and Dacotah Territory—A. Forrist, Jr., Athens, Pennsylvania.

Illinois, Indiana, Massachusetts, Maine, Virginia, Rhode Island, Alabama, Arkansas, Nebraska Territory, New Mexico and Indian Territory—H. Rogers, Mount Vernon, Iowa.

Wisconsin, Kansas, Maryland, District of Columbia, New York, New Hampshire, Vermont, Mississippi and South Carolina—C. A. Wheeler, Mount Vernon, Iowa.

Iowa, Michigan, Minnesota, Missouri, Kentucky Connecticut, Tennessee, Louisiana, Texas, Georgia and Florida—W. H. Goudy, Mount Vernon, Iowa.

The price of patterns, manufactured of the best quality of Russia iron, trimmed with brass, is $8 ; made of American imitation iron, trimmed with brass, $6. They will be sent to any part of the United States, by Express or otherwise, at these prices. They may also be had at all of the principal leather-finding stores in the country.

NOTES ON MILITARY AND NAVAL AFFAIRS.

THE SITUATION.

In our last number we announced the surrender of Mason and Slidell to the British government. These distinguished secessionists left Fort Warren on the 1st of January on board the steamtug *Starlight*, and were conveyed to Provincetown and placed on board the *Rinaldo*, an English war vessel, and were thence taken to Halifax, and our government is not broken up. It stands even against the prediction of the astute Dr. Russell of the London *Times*. The good judgment of the country, stripped of all false pride and conceit, elements which we inherited to some extent from the mother country, approves of the course of our government in giving up these men. Their retention could be of no possible use to us, and to refuse their surrender would have lead to an alliance between the Confederates and Great Britain that would have brought heavy additional burdens upon the loyal people. Besides this, the Secretary of State, in his discussion of the subject showed conclusively that the manner of the arrest had no warrant in our views of international law, as applied to the rights of neutrals on the high seas. This matter being thus disposed of it remains to be seen what other pretext may be seized upon by the fighting element of Great Britain to stir up another ground of quarrel with us. The British press in the interest of secession is quarreling with Mr. Seward about his correspondence with our ministers abroad about sinking the stone fleet in Charleston harbor, and other items of more or less annoyance to them, and it may be now that the *Warrior* has coaled up and troops and ammunition have been sent to the Canadas that some one of these sores, or a new one, will break out and run furiously. We have confidence, however, in the sober sense of the British people, and we believe that a reaction will speedily follow when the facts of Mason and Slidell's restoration are announced. We believe, also, that France, Russia and Prussia will require Great Britain to show respect to our rights, now that we have exhibited a disposition to respect hers, contrary to their declarations and expectations.

MISCELLANEOUS.

Matters in and around Washington and along the entire lines are progressing slowly, but we trust surely. The health of General McClellan has caused some uneasiness, especially at one time when his death was reported. The General is out, and in a very few days will be able to resume his usual laborious duties.

From Beaufort, S. C., we have late interesting intelligence. The steam transport *Vanderbilt* arrived here on the 6th inst., bringing 3,697 bales of sea-island cotton. A battle was fought on New Year's day at Port Royal Ferry, between South Carolina troops under Maxey Gregg and Federal troops under General Stevens. The South Carolinians were defeated, and fled from their intrenchments in confusion. It seems that a few days previous to the fight the steamboat *Mayflower*, while on a reconnoissance and making a circuit of Fort Royal Island, was fired into by a secession battery, and one man killed. For this insult, Commodore Dupont and General Sherman planned an expedition to attack this battery, which resulted in complete success. One Union soldier was killed and nine or ten wounded, principally of the gallant Eighth Regiment of Michigan, Col. Fenton. The earth works were destroyed, one 12-pound cannon captured and the Union troops returned to their quarters at Beaufort.

A sharp fight with the secessionists took place a few days since at Huntersville, a depot for their supplies in Western Virginia. An expedition was sent out to this place by General Milroy, consisting of 700 troops and 40 cavalry. The enemy numbered 750, and were routed witb a heavy loss, after a desperate fight of one hour. In departing from the town they left a large amount of army supplies, consisting of 350 barrels of flour, 300 salted beeves, 300 pounds of salt, large quantities of sugar, coffee, rice, bacon and army clothing, which report says were destroyed. Several Sharp's carbines, pistols, &c., were also captured.

A report has reached us of a fight on the Upper Potomac, at Hancock, Md. General Jackson, at the head of a large secession force, demanded the surrender of the town, which was refused, and he commenced shelling it, doing some damage to property. They also set fire to Cacepon bridge and destroyed it. General Lander is in command of the Federal troops, and opened fire with artillery upon the enemy, compelling them to retire. The opposing forces were on opposite sides of the river, and fought in this position, neither attempting to cross. The object of Jackson is to prevent the repair of the Baltimore and Ohio Railroad, which is intrusted to the care of General Lander. The latter has had reinforcement sent to him, and the latest news is that the secessionists were in full retreat toward Winchester.

Operations in Missouri and Kentucky have been marked by no special demonstrations during the past week. General Buell is pushing on his immense force into the face of the enemy, and a battle, fierce and sanguinary, must ere long be fought near Bowling Green. General Halleck is also busy, and has the charming good sense to keep his movements out o the newspapers.

TRIAL OF THE MISSISSIPPI GUNBOATS.—The gunboats at Cairo, which are preparing for an attack on the rebels, had a satisfactory trial of their iron plates recently. The target was of the same hight and thickness, of wood and iron, and placed at the same angle as the side of the boats. It was fired at with a 7-inch rifled gun and an 8-inch shell gun, at a distance of only 600 yards. Two of the shots from each gun struck the target fair and square, and in no case penetrating it. One of the rifled cannons struck on the corner of one of the plates, and it not being riveted, as on the boats, pushed its way into the body of the target, but did not injure in the least the inside surface. An 8-inch shell, filled with sand, and weighing nearly 100 pounds, struck the mark and was broken into fragments. A shell which burst exactly as it hit the target was also shivered in a similar manner. In fact, a man might have taken his dinner behind the target with perfect impunity.

THE MUSKRATS PREDICT A MILD WINTER.—The Milwaukee *Wisconsin* says it is going to be a mild winter, for Joel Hood, the celebrated auctioneer, who has been all over the Western territories, the Pacific States and the Sandwich Islands, and who probably knows as much about the peculiarities of wild animals as any man in the West, stakes his reputation upon the prediction that we are to have a mild winter, with prevailing winds from the south for the next six months. He bases his knowledge upon the doings of the muskrats, beavers and other animals last fall. He also says that it has been reduced to a certainty by scientific and ordinary observations, that whatever winds prevailed when the equinoctial line is passed they will prevail throughout the winter. Last fall it was southern winds, and therefore he is certain they will be the prevailing winds throughout the winter. The question herein raised will be fully settled by the 1st of March next.

COAL TRADE OF BALTIMORE FOR 1861.—The Baltimore *Sun* of Jan. 2d contains a commercial review of the trade of Baltimore for 1861, of which the subjoined is and extract :—The embarrassment of railway communications connecting Baltimore with the Alleghany coal fields has caused a great decline in the receipts of Cumberland coal, the total receipts being 156,618 tuns, a decrease of 242,390 tuns from the receipts of 1860. Of anthracite coals there were received 264,115 tuns, a decrease of 61,014 tuns for the quantity received the year previous. Of this coal 185,115 tuns were received by the Susquehanna and Tide Water Canal, 63,000 tuns by the Chesapeake and Delaware Canal, and 49,000 tuns by railroad.

In 1861 there arrived at New York from foreign ports 5,122 vessels of all classes, of which there were, war steamers, 25 ; war vessels, 2 ; steamers, 262 ; ships, 1,127 ; barques, 1,099 ; barquentines, 22 ; brigs, 1,340 ; galliots, 1 ; schooners, 1,243 ; canal boats, 1. Total, 5,122. Of these there were of American vessels, 96 steamers, 913 ships, 612 barques, 18 brigantines, 688 brigs, 764 schooners, 1 canal boat. Total, 3,092. Of British there were, 127 steamers, 107 ships, 236 barques, 3 brigantines, 501 brigs, 464 schooners ; total, 1,438. The vessels from all other nations only amounted to 592. The French shipping was a mere trifle, amounting to but one steamer, 12 ships, 9 barques and 5 brigs.

THE SANITARY CONDITION OF OUR WESTERN ARMIES.

We have before us a "Report on the Condition of the Troops, and the Operations of the Sanitary Commission in the Valley of the Mississippi, for the three months ending Nov. 30, 1861. By J. S. Newberry, M. D., Associate Secretary." We take from it the following extracts which will be found to be of general interest :—

THE GENERAL CONDITION OF THE TROOPS.

Since the publication of my former Report, the aspects of our field of labor in the Valley of the Mississippi have materially changed. The number of enlisted men in camp and field in that area now reaches the large figure of 250,000. On the whole, the percentage of sick is but little greater than during the summer, yet I think it will be found to hold good, as a general rule, that the mortality has sensibly increased. This is doubtless due to the combined operation of several causes. The multitudinous cases of trivial diseases occurring among all newly-enlisted men, and incidental to the change from civil to military life, no longer swell the sick list and fill the hospitals; and the more frequent, but less severe forms of malarious disease—ague and chill fever—have been succeeded by the rarer, but more grave, malarious dysenteries and bilious remittent fevers; while the eruptive diseases, as they are so prone to do, have multiplied in number and increased in virulence with the approach of cold weather.

CAUSES OF DISEASE.

In this category of causes I would include unnecessary exposure to wet and cold. The consequences following such exposure have been mainly entailed by insufficient protection against the inclemencies of the weather, such as defective tents blankets too few and of inferior quality, uniforms of too light material, overcoats wholly wanting or far too pervious to both cold and rain. And here I may be permitted to remark that I cannot but anticipate the gravest consequences from the inadequacy of the protection afforded by their clothing and bedding, such and so much as now furnished to troops soon to encounter all the severities of our arctic winter. It is my earnest conviction that few of our volunteers will be so located as to geographical position, or so protected in winter quarters, as to escape great suffering and serious disease, while guarded from the effects of cold only by their uniforms and a single blanket each. If it be determined that military necessity limits the transportation, and therefore restricts the bedding and clothing of the soldier to the present regulation standard, it is none the less a sad necessity, from which the gravest evils must follow. I am confident that few of our troops can endure the rigors of a winter campaign with less than at least two good blankets each and a more liberal supply of winter underclothing, socks and mittens, that even the most favored now enjoy. And I cannot but believe that the humane, the wise and prudent, both among army officers and civilians, will strain every nerve to secure to our soldiers as nearly an adequate protection against this great and impending evil as the circumstances of the case will possibly permit.

It must be borne in mind in this connection that all efforts to compensate the soldier for inadequate clothing and bedding, by raising the temperature in barracks or tent by stoves, or by carefully preventing the ingress or egress of air, will be a fruitful cause of the gravest forms of disease incident to camp life; and will be productive of even greater evils than excessive cold.

Passing over the evils consequent upon the neglect or incompetence of officers—unfortunately not unknown nor unfrequent in any division of any army—I am compelled to speak of the forced marches made by some of our troops in the West as a most fruitful source of disease, and one of the most potent influences which have operated to increase the percentage of sickness and mortality to which I have already referred as matter of grave concern. Without raising the question of military necessity, the obvious consequence of such severe and unusual duty cannot be ignored; and I think I am safe in saying that the disproportionate number of sick reported in the Valley of the Kanawha—173 to a regiment—and the still greater percentage in Eastern Kentucky, are the legitimate and necessary consequence of the hardships incident to the forced marches made by the divisions in these districts.

SMALL HOSPITALS BETTER THAN LARGE ONES.

The character and condition of the hospitals in which the sick of the western armies are treated, are fully given in the reports which follow. I may say, however, in passing, that hospital service in the West has assumed a new aspect since the presentation of my last report. Then the general hospital was almost unknown, and the regimental hospital, usually constructed of boards, small, open and airy, free from infection and uncontaminated by the emanations from the kitchen or privy, impeding in no respect the curative influences of nature's agents, left little to be desired as regards a habitation for the sick. As a consequence, the wards of no model hospital in the world could afford a more favorable exhibition of those cases of disease prone to become grave where a confined and vitiated atmosphere is substituted for the sunlight and pure air of heaven. With the advance of the season the regimental hospitals were deprived of many of their advantages, and the general hospitals which had sprung into existence were overcrowded with the increasing number of the sick.

THE WAY COFFEE IS MADE.

My attention was often called to the fact that this portion of the army is supplied with coffee in the sack, in witnessing the process of roasting and grinding or pounding in camp. The roasting is usually done in the camp kettle, by which means it is often rendered perfectly inodorous, or in other words, it is burned black. The pounding is done in the same vessel, often with the butt of the musket. Of course, coffee prepared in this way makes not only an innutritious beverage, but it is absolutely injurious. If coffee cold be properly roasted and ground without sophistication, and packed in twelve-pound tin cans, or tin pails with heils and covers, the government would make a vast saving in many ways, while the army would derive a great benefit from its use. Put up in the manner last specified, an article of great convenience in camp would be supplied.

THE LOYALTY OF KENTUCKY.

Though but incidental to the subject matter of this report, I cannot refrain from expressing my admiration for the fervent loyalty exhibited both in actions and words by the many distinguished citizens of Kentucky which it was my pleasure to meet. In their patriotic devotion the greatest sacrifices have been cheerfully made, and the strongest ties of nature and affection unhesitatingly severed. The virtues of these noble men and women, burnished by the bitterest trials humanity can suffer, shine with a luster which must be seen to be appreciated. My visit to Kentucky has been the saddest and yet most hope-inspiring episode of my experience in this fratricidal war, and I am sure I shall be pardoned for thus alluding to the instances of lofty self-consecration which I have witnessed.

CONCLUSION.

To give a *resumé* then, of the condition and wants of the troops in the Valley of the Mississippi, and the duty done and to be done by the Sanitary Commission, we have to congratulate ourselves, first, upon the marked amelioration of the sanitary condition of both camps and hospitals since my last report; second, on the general high character of the medical officers having the care of the troops, most of them having passed a searching examination by a competent Board appointed by the Governors of the States in which the regiments were recruited; third, upon the uniformly friendly relations and hearty cooperation existing between the medical and military officers of the different departments with the Sanitary Commission and its agents, with a general high appreciation of the importance of its aims, and approval of its methods; fourth, on the active and efficient cooperation of a large number of associate members of the Commission, who have formed Branch Commissions in the principal cities, which, by their earnest efforts and their moral influence, are affording most important aid in our work: fifth, upon the organization of a number of Auxiliary Ladies' Soldiers-Aid Societies, who are busily engaged in the preparation of hospital stores, whose bounty so liberally bestowed has alleviated much suffering, saved many lives, and enabled us to accomplish good which it would have been impossible to effect without their aid; sixth, on the liberality of the managers of railroad and steamboat lines and express companies, who have, by the transportation of stores free, or at diminshed rates, greatly added to our means of usefulness. On the other hand, we have to deplore the continued operation of avoidable causes of suffering and disease which call for our warmest sympathy and most earnest efforts, and which will, in the future, task our energies to the utmost, and exhaust all our resources in their removal. While the present percentage of sickness and mortality continues among our volunteers, we, as a people, stand convicted of inhumanity, and bad economy, a wastefulness of the doubly vital element on the present war, human life. We can never consistently suspend our labors till this charge can be truthfully denied.

Influence of Men on the Future.

Page in his "Past and Present Life of the Globe" indulges in the following striking reflections :—In reasoning on the future aspects of vitality, we must ever make allowance for the influence and operations of man, who comes on the present stage of geological time as a sub-creative power and new modifying agent. In the olden epochs the laws of change acted solely through the operations of purely physical agents, and what under their control took ages to accomplish, may now, under the agency of man, be brought about within the scope of a single century. To the material'sm and mechanism of the past we now add the mentalism of the present—an emanation "after God's own image," and a reasoning instrument in the hands of the Creator to effect most important changes on the vitality of the globe. The modifications brought about by man in his onward progress are already remarkable, though only the merest fraction of what they are destined to be under the influence of increasing population and higher civilisation. In his onward progress of cultivation, observe how many species of plants he destroys, and how many new varieties he creates; how by his drainage and tillage he modifies soil and climate, making new conditions, obnoxious and fatal to some races and congenial to others; and how, in taking possession of new countries, he destroys the carnivorous and dangerous animals, and substitutes the domesticated in their stead—extirpates the indigenous flora, and plants in its place the vegitation of other regions! Mark what changes the white man has wrought within the last few centuries on the life of the globe, in North and South America, in Southern Africa, in Australia, and in New Zealand, by the extirpation, the introduction, and the interchange of species! When we turn to the New World, we find the same process on an older and larger scale. All the domestic animals of Europe, naturally unknown in America, have firmly taken root in that continent, and many of them now roam in a wild state as freely as if they had been indigenous to the country. Even the "pests and vermin" of the Old World have insensibly found their way to the New; and the New has not been slow in making reprisals on the Old by the transmission of such unwelcome settlers. In the fulfilment of this great law of natural progress, the inferior races of his own kind are also vanishing before the civilisation of the higher; and however much our sympathies may be excited by the fact, their continuance would be only to retard that divine scheme of advancement to which everything above, beneath and around us has ever been incessantly tending. No scheme of benevolent enlightenment can ever avert the fate of the natives of New Zealand and Australia; no project of civilisation, however ingenious, postpone the doom of the Red Indian. As the waves of progress have successively swept away the nationalities, pre-historic and historic, of Asia and Europe, so the same tide is irresistibly swelling toward the obliteration of mental and moral inferiority in other regions. The order has gone forth from the beginning; its execution is inevitable.

Observe, then, what, on account of extirpation, interchange, and transmission of species, has been effected by man within the lapse of a few centuries, and note how impossible it is to predicate of future life-changes where such a power has been superinduced upon the purely physical agencies of nature! It is true that man's influence has its limit. He may modify, but he cannot create—extirpate, but cannot replace—may alter the distribution, but cannot change the character of functional performance. Over and above him are the great external conditions of nature, to which he is as subject as the meanest creature he modifies; but within certain limits he acts as a sub-creator, and this influence must ever be allowed for in all our reasonings on the future aspects of vitality.

New England Manufactures.

A correspondent of the Commercial *Bulletin*, gives some encouraging statistics respecting manufactures in several places which he has visited in Connecticut and Massachusetts. In Hartford, he states that at Col. Colt's Armory, there are now at work on arms, 1,500 men, averaging $2 per day; then there are several hundred more at work upon the buildings, which bring the monthly pay-roll to more than $80,000. Sharp's Rifle Manufacturing Co., is now in full blast day and night, and pay out $20,000 per month. The saddlery establishment of Smith, Bourne & Co., have had as high as 500 hands, monthly pay-roll amounting to $15,000. Woodruff & Beach, the builders of engines, have had 350 hands at work night and day some of the time; pay-roll, $12,000 to $15,000. Jewell & Sons, belt makers, $8,000 as a maximum figure. The Phœnix Iron Works employ 150 hands; pay-roll, $5,000 per month. Hunt, Holbrook & Barber, boot makers, have been doing an immense business, employing 100 hands on army work. The Hartford Manufacturing Co., widely known for its elegant plated goods, were among the very first to turn their attention to army goods. He states that $150,000 is disbursed in Hartford, monthly, to a population of 31,000.

The Dwight Manufacturing Co., S. Adams, agent, paid out last month $13,000; Ames's Manufacturing Co., G. Arms, superintendent, $22,000; E. Gaylord, Soldiers Leather Accoutrements, $10,000; G. Chicopee, Manufacturing Co., at Chicopee Falls, E. Blake, agent, $15,000; Maynard, Armes & Co., at Chicopee Falls, J. Macfarland, superintendent, $8,000—being $68,000 paid out monthly.

At Springfield, there are 2,000 hands in the United States Armory, about $90,000 are paid out per month, and in other establishments in this place about $10,000 are now paid out and distributed among 14,000 inhabitants.

In Meriden, Conn., with a population of 70,000, there are three establishments which are the most extensive of the kind in the country. They are the Meriden Britannia Co., which makes every variety of plated goods, and in the highest style of the art. The Hoop Skirt Manufactory of J. Wilcox & Co., which employs 400 to 500 hands. And the Ivory Comb and Pianoforte Keys Manufactory of Julius Pratt & Co.

MAYOR OPDYKE recommends the union of New York and city of Brooklyn in one municipal government, under the name of Manhattan. This would make a city second in size only to London.

THE debt of the State of New York amounts to $32,926,264.

Substitute for Silver in the Arts.

Not many years ago, people of wealth were ambitious of a display of silver plate as it was held to be an evidence of position in society. This order of things has passed away, as plated ware rivaling the solid in form and brilliancy can now be manufactured for a tithe of the cost, and all classes have adopted it. The best qualities of plated ware have a body of white metal, the inferior qualities having a body of brass.

The compositions of white metal are known to a very limited extent. We have very frequent inquiries respecting them, as reliable information on the subject is chiefly confined to workers in these metals, and not to be found in published standard works. We find a very interesting and useful article on this topic in a late number of the London *Ironmonger*, which will be found to be a valuable addition to the article on electroplating, on page 361, Vol. V. new series SCIENTIFIC AMERICAN. Our cotemporary says :—

The composition of white metal varies considerably, nearly every manufacturer, in fact, having some scheme of his own for producing it to "imitate more nearly than any other the genuine article," but in most cases the difference is simply a difference in the proportions of the metals used, the use of copper, zinc, and nickel being deemed indispensable by all. One will employ 16 lbs. copper, 8 lbs. zinc, and 3½ lbs. nickel; another deems it preferable to use 8 lbs. copper, 3½ lbs. zinc, and 2 lbs. nickel; whilst a third declares that absolute perfection can only be attained with 28 lbs. copper, 13 lbs. zinc, and 7½ lbs. nickel. No doubt each of these proportions give very fair results, but we unhesitatingly say that we have seen nothing to surpass the alloy formed of 8 lbs. copper, 3½ lbs. zinc, and 3 lbs. nickel. This is, indeed, a beautiful compound, and when carefully prepared it requires an excellent judge to distinguish it from silver itself, its appearance positively being precisely that of silver a little below standard. In fashioning the various articles, the process varies according to the form to be imparted. Sometimes the hammers and chisels alone are brought into requisition; at others the several segments are stamped by dies and soldered together to get the desired form. Next comes the chasing or engraving, which is effected by means of neat little hammers and needle-like chisels. Assuming it to be a tea-pot to be operated upon, it is first filled with a compound of hot pitch and chalk, which, upon cooling, becomes so hard and tough that the chisel can be used freely, without making the sides bend. After the chaser has done his work the teapot is passed to polisher, who carefully polishes it, and passes it on to the "electro-room," in which they are coated with pure silver by the electric current.

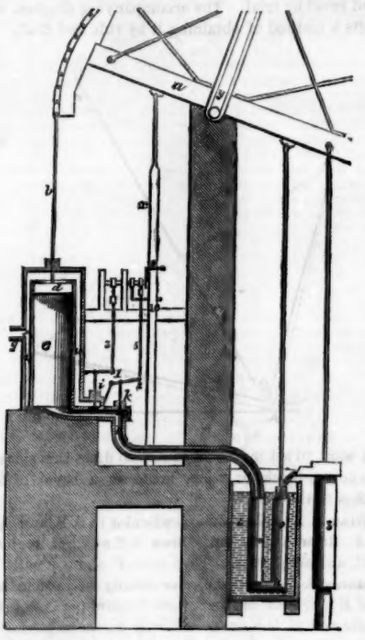
The wire from the negative end of the battery passes into a trough, containing a solution of cyanide of silver, where it is attached to the tea-pot and the other wire, which also passes into the same trough, and is connected to a plate of silver. the object of which is to supply the solution with fresh silver as it becomes exhausted by the deposition on the tea-pot. The electricity, decomposes one atom of the cyanide of silver in the trough, and forms another similar atom to make up for the decomposition. As electricity always takes the shortest route it can find, the salts of silver in the solution would not be equally deposited if they were permitted to remain motionless. To ensure a regular deposit a clockwork device causes a brass frame to move up and down the trough and keep the liquid constantly stirred. Before the tea-pot is put into the trough it is brushed with a soft brush and fine sand, then dipped in caustic potash, next in aquafortis, and then washed in nitrate of mercury until it looks milky. It is then put into the trough, and after a few minutes are taken out, brushed and put back again, being then left for five, six, or seven hours, by which time a sufficiently thick layer of silver will have been deposited. When it is taken out it is well brushed with stale beer, and is then ready to be burnished. The burnishing tools are of various shapes, and are made of fine steel or agate, according to the part of the operation for which they are intended. These burnishers are carefully rubbed over every part of the tea-pot that is to have a polished appearance, for it should have been said that when the article leaves the electro-trough it is anything but brilliant in appearance, every portion of it resembling far more closely that which is generally known as frosted silver. The burnishers are kept in order by repolishing them from time to time upon a leather strap, with thick soap-suds. The whole process may appear, to the inexperienced, to be extremely complicated, but in practice it is comparatively simple, and there are few industrial pursuits in which the manufacturer can be more certain as to the results he will obtain. Cleanliness and care, are the great safeguards against imperfect depositions in silver-plating. Grease and perspiration must be avoided.

SURFACE CONDENSERS FOR STEAM ENGINES.

Number II.

In the first steam engine of Newcomen, the steam was condensed in the cylinder by the application of cold water to to the outside, but subsequently the cold water was injected into the cylinder. James Watt's great improvement on the steam engine consisted in condensing the steam in a separate chamber from the cylinder, thus enabling the cylinder to be maintained at the constant temperature of 212° Fah. The first condenser of Watt consisted of a separate

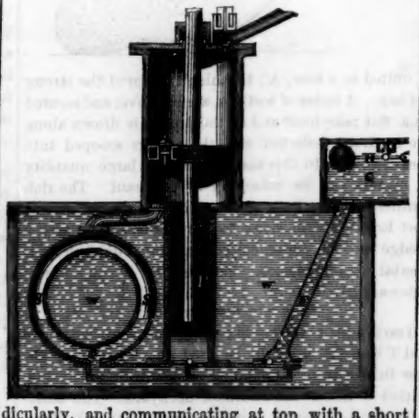
Fig. 3.



chamber for receiving the steam, and the water of condensation was applied on the surface—it was a surface condenser. The accompanying figure represents his condensing arrangement. The engine is single-acting, as it receives the steam on one side only of the piston, *d*, in the cylinder, *e*. When the steam has forced the piston to the end of the stroke, the puppet valve, *k*, is raised, and the exhaust steam rushes into the vessel, *m*, placed in the condensing chamber, *l*. A stream of cold water is supplied to the outside by the pump, *v*, and the steam is condensed inside of the vessel, *m n p*, and the water of condensation is drawn off by the pump, *o*. Respecting this surface condenser, Mr. Louch says :—

"The condenser on this occasion consisted of two pipes of thin tin plate, 10 inches or 12 inches long, and about ½th of an inch diameter, standing perpen-

Fig. 4.



dicularly, and communicating at top with a short horizontal pipe of large diameter, having an aperture on its upper side which was shut by a valve opening upward. These pipes were joined at bottom to another perpendicular pipe of about an inch diameter, which served for the air and water pump, and both the condensing pipes and the air pump were placed in a small cistern filled with cold water. It was found convenient afterward to change the pipe condenser for an empty vessel, generally of a cylindrical form, into which an injection played, and in consequence of there being more water and air to extract to enlarge the air pump. The change was made because, in order to procure a surface sufficiently extensive to condense the steam of a large engine, the pipe condenser would require to be very voluminous, and because the bad water with which engines are frequently supplied, would crust over their plates and prevent their conveying the heat sufficiently quick."

Although Mr. Watt thus abandoned the plan of surface condensation, and adhered to the injection system, he still occasionally turned his attention to it; and about the year 1776 he submitted to Parliament a plan of a surface condenser, consisting of a number of small tubes very much resembling the plan subsequently patented by Mr. Hall. This, however, he also abandoned, finding, it is said, that he could not obtain by that means so sudden or so perfect a vacuum as by injection; and also that the tubes became furred by a deposit which impeded the process of condensation.

He also at a later date included in his patent of a road locomotive, a system of surface condensation, the air on the external surface of the tubes carrying off the heat, but I am not aware that he ever carried this plan into execution.

In 1797, Mr. Cartwright designed and patented the engine shown in diagram 4, where the exhaust steam from the cylinder passes into an annular copper vessel, S, surrounded on both sides with water, W. The condensation water, together with any air which may have entered through imperfect joints, is withdrawn by the pump, P, worked by a continuation of the piston rod, and is thus returned to the boiler by the discharge pipe, F, through the cistern, G, in which there is an ingenious apparatus for getting rid of the air. This scheme failed, as might have, perhaps, been expected, partly through want of sufficient condensing surface, and partly from the general bad design of the engine.

In 1821 a surface condenser was fitted to a vessel called the *Post Boy;* it consisted of a number of tubes of copper, five-eighths of an inch in diameter and twelve feet long; but being constructed only for experiment, it remained in use only for a short time, but on what ground it was discontinued I have no information.

Hungary Improving.

This country has entered upon a great career of progress. The landed proprietors have established a system of cultivation by paid laborers, in lieu of the feudal system they abolished in 1848, and a great network of railroads and river navigation is about to come into operation. In this year (1862) three lines of cheap conveyance, intersecting Hungary and ending in Trieste, will be opened. These routes include about 2,100 miles of steam navigation, fed by about 350 miles of rivers or canals, traversed by common barges or boats; and 1,400 miles of railways, not including the Vienna and Trieste lines. To load the railway trucks and steamboats, Hungary has 25,000,000 acres of arable land, nearly 4,000,000 acres of meadows, 1,000,000 acres of vineyards, besides forest, moor, and mountain land; in all, upwards of 60,000,000 acres of land, more or less agricultural in its character. The soil is fertile, the climate favorable to corn crops, the landlords intelligent, and well acquainted with labor-saving machinery. Nothing but peace and liberty are needed to make it the granary of Europe, as well as a rich source of revenue to Austria, if her Emperor will consent to free institutions.

THESE holiday times are lively at many of our places of amusement, but at none more so than at Barnum's Museum, where the multitude of living curiosities continue to attract very general attention, and the beautiful new fairy piece, prepared expressly for the holidays, is the admiration of every spectator. Indeed, its gorgeous beauty and dazzling splendor cannot but command the approbation of all who witness it.

THE population of Asia is 720,000,000; Europe, 272,000,000; America, 200,000,000; Africa, 80,000,000; Australia, 2,000,000; making a total of 1,274,000,000.

A Substitute for Chloroform.

The intelligent Paris correspondent of the N. Y. *Express* furnishes some important information on local anæsthesia. A communication on this subject has just been made to the French Academy of Science, and may be useful to our surgeons and other medical men :—

"The dangers attendant upon the inhalation of ether, chloroform, &c., to produce insensibility during painful operations having often deterred patients from submitting to the process, and even caused a certain hesitation in operators, who would rather not, if possible, have recourse to it, the attention of medical men has been particularly directed to the discovery of some process by which the advantage of insensibility may be secured without danger to the life of the patient."

This communication is from Dr. Fournier, who lays the subject before the Academy, and recommends a new process for obtaining local anæsthesia, by what he terms *chloracetization*.

"Having," he says, "subjected a part of my body to the action of the emanations from a mixture of acetic acid and chloroform, I obtained local anæsthesia. The numerous experiments I have since made on myself or animals, and some of my patients, enable me to state the following proposition :—If in an apartment, the temperature of which marks more than 17° Centigrade (63° Fah.), the orifice of a thin glass phial, containing a quantity of pure crystallizable acetic acid equal to one-fourth of its capacity, and an equal quantity of chloroform, be exactly applied to a healthy and clean skin, not deprived of its epidermis; and if this phial be constantly maintained at the temperature of the hand a complete insensibility of that part, and some of the deeper ones, will be obtained in five minutes, and at the cost of a very slight sensation of pain. The vapors of acetic acid and chloroform mixed together, and applied with a glass retort to a part which it is intended to render insensible, the adjoining parts being protected by diachylon plaster from the action of these vapors, may be employed as anæsthetics in all operations of low surgery, and in many of the higher branches, in all cases where general anæsthesia may be considered dangerous, or declined by the patient."

Danger of Chloroform.

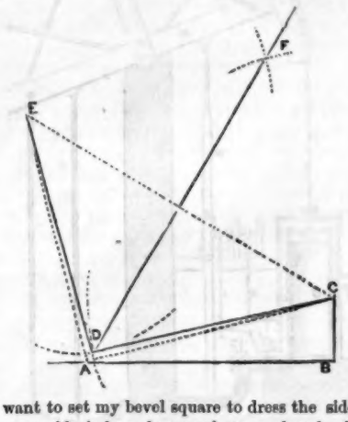
During the performance in Paris lately of a critical surgical operation, the patient, a young lady, was put under the influence of chloroform, and came near dying from the effects of this agent. "For a whole hour," says a correspondent, "the operation was arrested by efforts to bring back the life that seemed to have fled forever, for the poison had made a sudden and most powerful effect on the nervous system, and it was only by the most intelligent and persevering efforts that a fatal result was prevented. M. Nelaton, who directed these efforts, adopted a plan which is now generally followed in similar cases in this country, that of throwing the head down and the feet in the air, at an angle of about 45 degrees. By this maneuver the brain and heart, with an increased quantity, receive an increased amount of stimulus from the blood, and life is preserved until the volatile poison had spent its force and is dissipated. While the body was thus held, frictions and artificial respiration were resorted to, a piece of cork was placed between the teeth, and when necessary the tongue held from the mouth by means of a hook. This treatment of the case is thus mentioned in detail, because deaths from this highly useful but dangerous agent are frightfully on the increase, especially in England, and in the hope that they may be useful to other surgeons."

Changing Seeds.

The Irish *Agricultural Review* says :—The practice of frequently changing seed is now recognized in many sections as essentially necessary to the production of a first-rate crop. We all know that the practice of procuring seed potatoes from a distance—say 20 or 25 miles—and from different kinds of soil, has a most marked influence on the product. While the *rationale* of this is not quite obvious, the fact is indisputable. The same result follows also in the management of corn, wheat, pumpkins, beans and garden seeds. Even where exchanges are made between farmers in the same neighborhood, and where there is no very marked difference in the geological or mineral characteristics of the soil in the respective localities, the practice is inducive to improvement. Let those who have never tried the experiment do so—on a small scale at first—if they are at all skeptical, and mark the results, both as regards quantity and quality of crop.

RULE FOR CUTTING BEVELS.

Wagon and carriage makers very frequently have occasion to fit a block in the corner of a box that is made on a bevel, and most mechanics obtain the desired bevel by trial. The accompanying diagram exhibits a method of obtaining it by rule and draft.



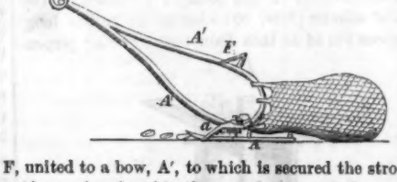
I want to set my bevel square to dress the sides of the corner block for a box made on a bevel of four inches to the foot.

Draw A B=12, B C perpendicular to A B, and equal to 4; draw A C; from A draw A E at right angles to A C, and equal to it. Then from E and C, with the distance A B, describe circles cutting each other in D, and E D C will be the angle required. Bisect this angle and C D F or E D F will be the angle for the miter of the boards for the ends of said boards.

After the draft is made the triangle must be transferred to the edge of a board in order to set the bevel square. H. B. A.

OYSTER DREDGE.

The common oyster dredge resembles a long pair of tongs, which are thrust down into the mud and the jaws closed; only about from three to six oysters are taken up with such a dredge at once. The accompanying figure represents an oyster dredge which consists of a pair of sledge runners, A, and a deflecting board,

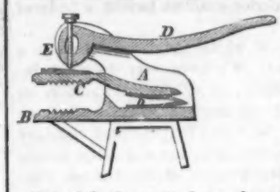


F, united to a bow, A', to which is secured the strong net bag. A series of teeth, *a*, are bent over and secured on a flat rake-head and as the dredge is drawn along the teeth are deflected and the oysters scooped into the net bag. In this manner quite a large quantity of oysters can be taken up at one haul. The rich southern oyster beds on the Virginia shores, and at Port Royal, are now free to our soldiers; and such a dredge will be found convenient for providing regimental oyster messes. Patented by W. L. Force, February 21, 1860.

TESTING SHIP IRON.—Sixty specimens of bar, angle and T iron, designed to be used in constructing the new British iron war steamer *Achilles* were lately submitted to test at the Chatham dockyard. The admiralty test of strength for ship-iron is that it shall stand 22 tuns to the square inch with the grain and 19 against it. All of the samples but one stood the tests, and some of them stood the strain of 30 tuns without showing the least flaw. The *Achilles* is to be covered with 5½-inch rolled iron plates, but the government is not yet satisfied that rolled iron is superior to hammered plates, hence no contract has been made for the plates of the other three new war frigates that are to be built for the British navy.

SPRING NUT CRACKER.

A very common nut cracker consists of a pair of jaws, which are opened and closed by two legs and are similar in action to a pair of blacksmith's tongs. The annexed figure represents a nut cracker having one stationary and one moveable jaw, B, C, operated by a cam lever, E, acting on an inclined plane. A spring, *b*, renders the moveable upper jaw self-opening. The action of the lever, D, forces down the upper jaw and cracks the nut between the two. The upper jaw is adjustable by a set screw to adapt it for nuts of various sizes. This cracker only requires to be closed to crack the nuts, the jaws are opened by the spring to receive them. Patented by Lyman Clark, January 24, 1860.



Elementary Facts in Relation to Steam.

1. A cubic inch of water forms a cubic foot of steam, when its elasticity is equal to 30 inches of mercury.

2. The time required to convert a given quantity of boiling water into steam is six times that required to raise it from the freezing to the boiling point, or from 32° to 212°, supposing the supply of heat to be uniform.

3. When a quantity of water is exposed to a given temperature, the quantity of steam formed in a given time will be as the surface, all other things being equal. The quantity will also be jointly as the force of vapor answering to each degree of heat, and the surface. The depth of water evaporated, in a given time, will be as the force of vapor, whatever the surface, if the mass be uniformly of the same temperature. When the force of vapor is 30 inches, and the temperature at 212°, this degree being just preserved only, the depth evaporated is 1.3 inch in one hour. This will be near the truth for this temperature.

4. When a quantity of water is raised to the boiling point, or 212°, it requires as much heat to give it the elastic form as would raise the same water 900° higher. If its volume were not changed by the heat, that is, if it could be prevented from expanding, its temperature would become 1,112°, with the same quantity of caloric. Thus, agreeably to fact the 2d, the heat required to convert water of 212° into steam is six times that required to raise the temperature from 32° to 212°.

5. The same weight of water, in the form of steam, contains the same quantity of heat, whatever may be its temperature or density; that is, the temperature at which the steam is formed, added to the degrees required to give it the elastic form, is always a constant quantity. The meaning of this is, that if a given weight of aqueous vapor, at 100° for instance, were compressed till its elasticity became equal to that at 212°, no heat being allowed to escape, its temperature would become 212° by the condensation; and it would, of course, contain the same heat as steam formed at the same temperature, viz., 212+900, as mentioned in the last fact.

THE Lake Superior iron mines show, for the year just closed, a very considerable reduction in yield, as compared with 1860. In the last-named period the product shipped was 150,000 tuns, while that of 1861 is but 40,000 tuns. The capital invested in the mines, including railways, furnaces, &c., is stated by the Marquette *News* to be $2,286,000, and in return for this there has already been sent to market 442,000 tuns of iron, valued at $1,326,000, before its shipment from Marquette. The average cost of mining is estimated at fifty cents per tun.

COTTON IN LIVERPOOL.—By the latest advices from Europe, we learn there were in Liverpool, of American cotton, 253,610 bales; Surat, 310,370; Brazil, 27,920; West Indies, 12,500; other descriptions, 2,410. Last year, at the same time, there were in Liverpool 450,390 bales of American cotton and only 93,940 bales of Surat. There is really more cotton in Liverpool just now than there was in January, 1861, and if none arrives from the United States during the entire year, there will be sufficient to keep the English factories running two-thirds of the time.

Correspondence

The Motion of Rockets.

Messrs. Editors :—The information on page 389 of the Scientific American appended to the article on Projectiles for Rifled Cannon, viz., "that a vacuum in the rear of my projectile would not prevent the rocket composition from propelling the missile forward," I trust may be correct, as it would certainly be advantageous to my proposed plan of projection. We have, however, two distinct theories of the motion of rockets, the one by Mariotte, and the other by Desaguliers; the latter attributes their motion to the momentum of combustion, and the other to the elastic nature of the gas generated by the combustion and the resistance of the atmosphere. Desaguliers illustrates his hypothesis as follows :—"Conceive the rocket to have no vent at the choke, and to be set on fire; the consequence will be, either that the rocket will burst in the weakest place, or, if all the parts are equally strong and able to withstand the impulse of the flame, the rocket would burn out immovable. Now, as the force of the flame is equable, suppose its action downward, or that upward, sufficient to lift forty pounds, as these forces are equal, but in contrary directions, they will destroy each other's action. Imagine then the rocket opened at the choke; by this means the action of the flame downward is taken away, and there remains a force equal to forty pounds acting upward to carry up the rocket and the stick."

However ingenious and plausible this reasoning may appear, we are by no means inclined to admit its accuracy. [See the discussion of this subject more at large under the article "Rocket," in Dr. Rees's "Cyclopedia."] It is doubted whether a rocket would ascend at all in a vacuum. Also, if the theory is correct, the larger we made the choke of the rocket, that is, the more the internal pressure is released at this end the greater would be its upward tendency, which is contrary to practical experience.

The theory given by Mariotte, which attributes the motion of rockets to the resistance or reaction of the atmosphere, we believe to be the most tenable, and to explain most satisfactorily the various conditions and results in the flight of these projectiles. If Desaguliers's theory, which appears to be the one on which the remarks in the Scientific American above referred to are predicated, is true and correct, would it not follow from thence that the most simple and efficient mode of propelling steam vessels could be effected by merely placing the boilers on deck, fore and aft, and allowing the steam to blow off sternwise. The steam in this case (like the inflamed composition in the rocket) "would press against the walls (of the boiler) equally in all direction; but if an orifice is made in the rear, by which the gas (steam) may escape, the pressure in that direction is removed, and as the pressure against the opposite wall (of the boiler) continues, the boiler and its appurtenances would be driven forward." The difficulty, we apprehend, in the application of this theory to the practical results, would be the fact that when the orifice is made in the rear of the boiler or of the rocket, the pressure would not continue the same against the opposite wall. The steam, or gas, acting on the principles of a compressed helical spring, for instance, between the two opposite walls, the moment the rear end of this spring is released from compression by the removal of the rear wall, or any part thereof, the tension or force of the spring on the opposite wall becomes reduced and diminished in proportion. Hence, in the case of rockets, agreeably to Mariotte's theory, it is plain that so long as the rear end of this spring (inflamed gas) has a point of resistance to bear against, as the atmosphere; that the opposite end of the spring must be efficient in its action to press against the forward end or wall of the projectile to drive it forward in its course.

Charles Potts, Civil Engineer.

Trenton, N. J., Dec. 29th, 1861.

[There is no necessity for the slightest obscurity or confusion in regard to this matter, as the principles involved are exceedingly simple. There can be no doubt that the rocket is driven forward by the pressure of the gas against the forward wall of the chamber not being counterbalanced by an equal pressure against the rear wall. All circumstances which aid in keeping up this pressure assist in imparting velocity to the rocket. An obstruction of the flow from the rear orifice by a surrounding atmosphere does aid in keeping up the pressure, but this obstruction is not absolutely necessary, as is demonstrated by a Barker mill running in a vacuum—a common class experiment. To keep up the pressure in the Barker mill the orifice is made very small in proportion to the size of the supply pipe. The Avery engine is a steam engine on the principle of the Barker mill, and the one that was running for some twenty years in this city, had orifices, if we remember rightly, only the $\frac{1}{32}$d of an inch square, while the steam pipe was $\frac{3}{2}$ or 3 inches in diameter. This engine was surrounded by a box and run in an atmosphere of steam—steam being lighter than air, and consequently offering less resistance.

In order to obtain the whole power from steam issuing in this way it is necessary that the rocket or body from which it issues should move with a velocity just equal to the velocity of the escaping jet. Consequently a steamboat could not be economically propelled in the mode suggested by our correspondent unless it were running with a speed equal to the velocity with which the steam was issuing from the boiler into the atmosphere. Were there no economy in expansion we cannot see why the Avery engine should not be the most effective, as it is the most simple of all forms of the steam engine. Even with its manifest disadvantages, we believe its application to the driving of screw propellers is worthy of being tried.—Eds.

Northwestern Armory.

Messrs. Editors :—As it is about decided that an armory must be established in the Northwestern States, it has inspired some localities with a mania of sudden riches, which for some reason they suppose would come to them by having a United States armory near their front doors. They use plausible arguments, *pro* and *con*, for their particular locality, and even insist that they must have it on account of their money as an inducement, and their commercial prosperity requiring protection; others, because they have nothing particular to make them wealthy, and need it to make them so. Now it is our opinion modestly given, that no state or city, as such, has any claim or right, to dictate where it shall be established; but let them show their natural advantages, and as a loyal people let them rather insist that natural advantages shall be the first consideration. If some of our western cities have become great by reason of their commercial advantages, it does not necessarily follow that they must have a national armory or navy yard, providing the government can make a musket or rifle, or even a gunboat, for 20 or 30 per cent less at some other point, and this depends entirely on natural advantages—in motive power, the facilities for obtaining material for the manufacturing of arms, and location in a military point of view. For instance, the Lower Fox river in Wisconsin show many favorable localities between Green Bay and Lake Winnebago, and in fact from practical observation both in North and South America, we think it has not its parallel on this continent in all its advantages combined, and mainly in the uniform flow of the river, and its extraordinary motive power—having within 30 miles a fall of 175 feet, and a discharge of 600,000 cubic feet per minute, thus yielding a natural motive power of 138,257 horse power, and the even flow of the river is regulated by Lake Winnebago—the great natural reservoir covering an area of more than 175 square miles. We believe the national Armory in Springfield, Mass., is, and has been, the most successful manufactory of arms in the country, and at the same time the government has been at great expense from time to time in creating water-powers on Mill river by building dams, and forming reservoirs, and by flowing land, in order to obtain a sufficient supply of water to run their shops during the day, for a considerable part of the year. When we compare this motive power with Fox river and its surrounding advantages in timber and lead, and also its proximity to the iron and copper mines of Lake Superior, it will hardly bear a comparison. In conclusion, we will give it as our opinion that the Northwestern Armory will be located where the government finds it for its own advantage; and then, if our large and commercial cities need arms, let them have arsenals and supply them with arms from the armory. This we think will be the policy of the government. J. M. B.

Wisconsin, Dec. 26, 1861.

Harbor Defence—Torpedoes.

Messrs. Editors :—As the attention of the country seems to be partly directed to harbor defences I will call your attention to a device which I saw described a long time ago in the Scientific American.

The device was a long beam of timber, shod on one end with steel or iron, and pointed so as to pierce the bottom of a ship. The beam was anchored with the sharp end left, at an angle sufficient to bring it a little under water and out of sight. It strikes me that it might be still further improved by the addition of a torpedo which could be easily applied, and made to act with great efficacy when struck.

H. R. Holman,

Kansas City, Mo.

Welding and Tempering Composition.

Messrs. Editors :—Owing to the high price of borax, I have been experimenting to find a substitute for welding purposes. I have found good results from 3 parts of copperas and 1 part sal soda, which costs only one fourth that of borax. I think a solution of the above would make good compound for tempering; it has the property of recovering steel that has been burnt. If blacksmiths will adopt this composition it will be a great saving to them.

A. E. Jerome.

New Westfield, Ohio.

Diphtheria.

The Philadelphia *Ledger* states that diphtheria has been unusually prevalent this winter in various districts in Pennsylvania, and very many cases have resulted fatally, owing to inattention in the early stages of the disease. Some very good advice is given regarding its early symptons, and how it should be treated. The *Ledger* says :—

It generally begins in a family among the children, one of whom will be restless and feverish for a day, or with symptoms not very unlike those which precede scarlet fever, exhibiting strong constitutional derangement. Then comes on a complaiut of soreness in the throat, followed by small patches of white, or sometimes yellowish coating matter on the throat. The moment these appear no time should be lost in sending for a medical man who has had experience and success in treating these diseases, because there are in fact two diseases to be treated at once. One is in the throat, where there is a local danger; but there is also another in the fluids of the whole body, which is, after all, perhaps the chief thing, though most out of sight.

It is well known that the best mode of treating scarlet fever, measles and even typhoid fever, is to regard them as the effects of some poisonous matter inhaled through the lungs and carried perhaps, as the oxygen gas is carried, through the capillaries of that organ into the circulatory system. In scarlet fever and measles the best treatment has therefore been found not to bleed or reduce the system, but rather to stimulate it so as to aid it to throw off to the surface the poison which in those case blossoms out on the skin and dies there. The same sort of general treatment is found most useful in diphtheria. If a child has an ordinary attack of sickness, or sore throat, a little abstinence or opening medicine will generally reduce it. But in a disease of this kind, on the contrary, a generous diet and a gently stimulating treatment seems to strengthen nature to throw off the disease. Whether diphtheria is contagious or not has been doubted. In all probability it is not. But it may and does become epidemic in the atmosphere. Whenever there is exposure to it, fresh, pure air is one of the best of preventatives and even medicines both for the individual patient and for the prevention of the spread of the disease. A room well aired and lighted and warmed, so freely as to allow of a constant change, without draft, or any extreme of heat or cold, will of itself do much in the way of medicine. But there is no time to be lost in the commencement of active treatment the moment the disease shows itself.

The two Copper Smelting Furnaces at Baltimore.—The two large copper smelting works of Baltifrom various causes have not been able to continue in full operation during the year 1861, but they have turned out during that year about 14,000,000 pounds of refined copper. About one-fourth of the ores used was the product of the United States, and the balance was imported from the west coast of South America and Cuba, requiring for its manufacture 30,000 tuns of bituminous coal. The bulk of the ores imported is paid for by the shipment of provisions and Eastern manufactured goods to South America. The market for one-fourth of the refined copper is found in the various factories of the United States, and the balance is sent to Europe, where it competes with the foreign-made article.

California Items.

ROCK OIL.—The San Jose *Mercury* states that the discovery of coal oil is creating an excitement among the Santa Clara people. An oil spring, near Moody's Mill, on the Santa Cruz road, is really worthy of attention. Some men felling timber for sawlogs noticed, on felling a tree across a piece of ground, that the water, as they supposed, shot up as the result of the concussion. Directly after this a very unpleasant smell was perceptible. This led to an examination, when a small hole was dug, which filled with oil. This led to further search, and some other springs have been discovered. The original spring will yield, it is estimated, from four to five barrels.

SULPHUR ROCK.—On the borders of Clear Lake there is to be seen, on a chain of hills, an enormous white mass, which looks like a heap of slaked lime; this is a rock of sulphur, the exterior of which is composed of a mixture of sulphur, of sand, and earthy impurities, bleached, no doubt, by contact with sulphurous smoke and atmospheric influence. On breaking this crust, numerous fissures appear, and cavities studded with beautiful crystals of sulphur. Through these fissures, which seem to communicate with the interior, hot vapor and sulphur smoke rise continually. This mass of sulphur, commonly called White hill, now bearing the name of Sulphur bank, covers a space of about twenty acres, and is about fourteen feet in depth. It varies in color from bright yellow to deep black, and is remarkable for its purity.

BORAX SPRINGS.—Below Sulphur bank, in a ravine, there flows a thin stream of water, issuing from springs, and strongly charged with boracic acid, which soon sinks and is lost in the sands. The two sides of the ravine, for a space of several yards, are covered in summer with a crust of boracic acid. Several other springs, which seem to rise from the sulphur beds flow into the ravine. These hot springs yield about 7,000 pints per minute, consisting of borax, boracic acid, and a small quantity of silicious matter. It would, probably, be easy to intercept them before they penetrate the lake. These springs, properly worked, would produce enough borax to supply half the consumption of Europe and America.

ALKALI LAKE.—Near the boracic ravine, is a pond, covering about one hundred acres, called alkali lake, from the nature of its waters, which are about three feet deep and of a boracic alkaline character. The bottom of this lake is covered with a gelatinous substance about four feet in depth, which resembles soap in its smell and qualities. This gelatinous substance is full of crystals of borax, varying in size from a pea to lumps weighing half a pound. Beneath this bed of natural soap is a stratum of blue clay, in which very large crystals of borax are found. These alkaline waters also contain a great deal of iodine.

In Aurora, Washoe district, three new quartz mills, of eight stamps each, have recently been set in operation, and the machinery for six more new mills has arrived and will soon be up.

Wintering Bees.

T. B. Miner writes to the *Genesee Farmer* the following in regard to giving aid to poverty-stricken swarms in winter :—

Bees that are protected in out-door situations from the severe frosts of winter by coverings of any kind should not be disturbed, as the more quiet they are kept the better they will pass the winter. Nor should they be aroused from their lethargy in any case, unless proper feeding of families short of honey has been neglected in the fall. In such cases, if the bees must be fed or die, on the first mild day take honey in the combs, if it can be obtained, and place it where the bees can reach it, without going over an inch or two from where they cluster. If there are holes in the hive that lead to an upper room or chamber, rap upon it smartly, and where the bees most appear there place the honey, taking care that a portion of honey is so placed that the bees will be drawn out to the main supply. Where comb honey is not to be obtained either strained honey or sirup made of sugar will be a substitute. Take white coffee sugar and place it in a kettle, to which add about half a pint of water to the pound; heat it to the boiling point, then skim it and turn it into a pitcher. When fed to the bees this sirup should be slightly heated, in order to allow it to enter the cells of honey combs easily. A piece of empty comb should be placed where the bees will have easy access to it, and the cells filled as often as can be done conveniently. In this manner a family of bees may be kept from perishing till the next harvest comes around.

Medical Treatment of the Late Prince Albert.

There were fluctuations from time to time, and even within an hour of his death the Prince expressed himself as strong enough to get out of bed; nevertheless, a terrible fit of congestion of the lungs ensued, in which he expired, shortly before eleven at night.

The Prince's constitution was one of those which was not calculated to bear the brunt of an enfeebling zymotic disease. Spite of an active athletic life and of careful diet, he displayed an early tendency to increase of bulk which is rarely compatible with a healthy rigidity of fiber. He was easily depressed by a common cold or any other slight accidental illness, had a feeble circulation, and firmly believed that any severe illness would at any time be fatal to him. How and when he contracted his fatal illness is matter of conjecture purely. All maladies of this class have a "period of incubation." The fatal zymotic poison is imbibed, but it dose not at once show its full effects. It broods for a certain number of days, like leaven, in the veins of the victim before there ensues that shivering fit, of greater or less intensity, which is the starting point of the actual fever. Some poisons, like the smallpox, have fixed periods of incubation; others, as the scarlet fever, are uncertain, for there may be no interval whatever—the fever may begin immediately on the receipt of the poison. In the typhoid the period of incubation is probably about a week, and the source of the fatal poison must have been at some place which the Prince visited during the last week of November. Was it Cambridge? Was it South Kensington? It is vain to speculate. The causes of typhoid fever still abound even in places which ought to be the most exempt from them. Like poisons of their class, they evidently do not affect all alike, but only some persons who are predisposed, and no one who travels much can be sure that he may not meet with them.

So soon as unfavorable symtoms manifested themselves, Sir James Clark and Dr. Jenner requested that the patient should have the benefit of additional advice, and that their own responsibility should be divided. This proposition was very unwillingly entertained at first by the personage most nearly entersted, partly from her unbounded confidence in her advisers, and partly from fear of still further depressing the vital powers of the Prince, and increasing his despondency by alarm at indications of increased danger. The repeated request of the physicians, however, was at length complied with; and two physicians were specially selected by the royal family—Sir Henry Holland and Dr. Watson; the former distinguished by his knowledge of the minutiæ of therapeutics and the peculiarities of aristocratic life, the latter for having enjoyed some of the largest fields of experience, and for the reputation of possessing a most mature and sober judgment and unimpeachable conscientiousness. The confidence which the royal family placed in their advisers is fully shared by the public and by the profession. They may be sure that the most refined and energetic resources of medicine and diet were employed to save and sustain the patient's vital powers. After the fatal event, the Queen, with a calmness and dignity which never desert her, expressed her warmest thanks to Sir James Clark, as one of her oldest and best friends; and more than one member of the royal family testified to Dr. Jenner their gratitude for the attention which he had lavished—unavailingly alas!—on their departed relative.

A NEW BOMBSHELL.—The Buffalo *Courier* gives an account of a newly-invented bombshell or rocket which was tried in that city a few days ago with successful results. This journals says :—

The rocket consisted of a cylindrical can, one chamber of which contained about a pint of fluid, and the other some three ounces of powder. Upon being fired it exploded and scattered the fiery fluid in all directions. The flames might be estimated at fifty or sixty feet in circumference. The fluid used burned seven minutes, notwithstanding the application of water. Although the experment tried was on a small scale, we see no reason why ten or twenty gallons of fluid, fired by the same means, might not work terrible destruction to the ships or fortifications of an enemy. We understand that another trial, with a much larger bomb, will be made in a short time.

Home-made Barometers.

A correspondent of the *Visitor* (Franklin, N. H.) gives the following method of making "a reliable barometer to indicate atmospheric changes :"—

Take two sheets of pasteboard paper of any convenient size, say three feet long by two feet wide. Bring the ends together, and glue or paste them tight, each sheet by itself; and they will look like two pieces of paper stove pipe. Cut thin, round boards exactly to fit in the ends of these paper cylinders. Carefully glue or nail them tight. Now you have two air-tight paper drums with wooden heads. Take a pole of any length you desire—three feet or twelve feet—let one drum be fastened to each end of the pole. Now balance this pole with the drums on each end, on nice pivots, in the middle. Then bore a gimlet through the end of one drum, and you have a good Farmer's barometer. One drum is air-tight. One has a hole in it, so there will be more or less air in one drum than there is in the other, according as the surrounding air is dense or rarified. Consequently, in dense or heavy air, the tight drum rises, while the one with the pinhole in it goes down. Crosswise through the middle of the bar, or pole, should run a stick as large as one's finger, a foot long, with wire-gudgeons, on which the instrument should vibrate or teeter. Let the ends of the pole be slightly lower than the middle that the whole do not make a somerset: smear all with glue or oil, so that no air enter only in the punctures mentioned. Have something you can slide through the bar to keep it nearly level. Mark, if you please, figures along the pole to show how far you have moved the balancing poise, though for this there is but little need.

This instrument may not be so perfect as a costly barometer; but for all practical purposes it is all one could ask. I have had one more than a year. I look at it a dozen times a day. They could be made and afforded for fifty cents apiece. They could be made as long as a barn, and placed in the loft, with an indicator, to show the distant mower when to make his hay.

Eclipses for the Year 1862.

There will be five eclipses this year, as follows,—

1. A total eclipse of the moon just before and after midnight, of June 11. Total eclipse begins one hour and seven minutes after beginning. Total duration, three hours seven minutes.

2. A partial eclipse of the sun June 27, in the morning. Invisible in America, but visible in the Indian Ocean.

3. A partial eclipse of the sun November 21. Invisible in America, but seen in the great Southern Ocean.

4. A total eclipse of the moon early in the morning of December 6. Visible. The eclipse becomes total one hour and nine minutes after the beginning, and lasts one hour and thirty-two minutes. Total duration, three hours and forty-nine minutes.

5. Partial eclipse of the sun December 20. Invisible in America, but visible in Asia generally.

THE NAVAL WARS WITH ENGLAND.—At the commencemet of the struggle of the United Colonies with Great Britain the former had no ships, but 42 were fitted out during the war, and, according to the best authorities, the American privateers roamed the seas in every direction, and captured during the war 803 British vessels, with merchandise valued at more than $11,000,000. Of a fleet of 60 merchantmen which left Ireland for the West Indies, 35 were captured by the American cruisers. At the beginning of the war 200 ships were employed in the trade between Ireland and the West Indies; at the end of the war there were only 40 engaged in it. In 1812 the United States navy consisted of only 20 vessels beside gunboats. In these, Hull, Decatur, Bainbridge, Rodgers, Porter and other gallant seamen boldly went to sea. Their exploits have been the theme of praise ever since. It is estimated that during the first seven months after the declaration of war American cruisers captured more than 50 British armed vessels and 250 merchantmen, with an aggregate of more than 3,000 prisoners, and a vast amount of booty.

GRAIN TRADE OF THE LAKES.—There were shipped from Chicago, in 1861, during the period navigation was open :—

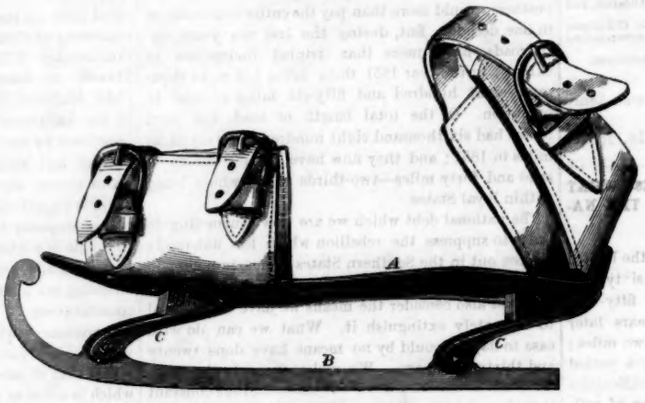
Flour	546,900 bbls.
Wheat	14,999,860 bush.
Corn	23,989,360 bush.
Oats	1,500,750 bush.
Rye	368,758 bush.
Barley	72,475 bush.

Reducing the flour to bushels of wheat, we have here an aggregate of 43,765,703 bushels of grain shipped by lake from Chicago in 1861.

THE Mount Cenis tunnel is now being bored at the rate of about seven feet per day; the work being confined to the south end. But in the course of January or February work will be commenced at the north end also, when the rate of progress will be doubled. It will require six years, however, to complete this longest of all tunnels.

Improvement in Skates.

There has been no more impressive proof of the tendency of a demand for inventions to call them forth, than is furnished by the great number of improvements in skates that have resulted from the present extensive use of these articles. Among these improvements are several plans for making the skate easier to the foot by introducing springs into its construction. It is found in practice that the spring skate fatigues the foot if the spring yields at any time more at one end of the skate than at the other, and to obviate this objection is the principal aim of the invention here illustrated.



GOODYEAR AND SPRAGUE'S SPRING SKATE.

This skate is so constructed as to keep the runner, B, always parallel with the foot stand, A. To this end the levers, C C, are attached by pivots, *a a*, to the runner, and by pivots, *b b*, to the foot stand. The springs are wedges of india rubber, D D, inserted between the inclined levers, C C, and the foot stand, A. The levers are prevented from turning forward at their upper ends and thus allowing the runner to fall away from the foot stand, by the rear lever being carried above the pivot and brought against the end of the foot stand. By this arrangement, while all the advantages of the spring skate are secured, the runner is always kept perfectly parallel with the foot stand, thus preventing unequal strains upon different portions of the foot and producing a peculiarly easy and comfortable skate, as we can certify from personal trial.

The wearers of this improvement also enjoy an acceleration of speed in forward movements that cannot otherwise be realized. This superiority is especially noticeable when the ice is a little rough. The springs serve to allow the runners to mount and pass obstructions in an easy gliding manner, without those abrupt concussions which usually check the momentum of the skater. A gentleman of our acquaintance who uses these skates says that they are as good to him as the famed seven-league boots. Although he is by no means a fast skater they enable him, with the utmost ease, to outstrip all other competitors. This is upon roughened ice. Upon smooth ice he thinks that they also have an advantage in speed, though not in so marked a degree.

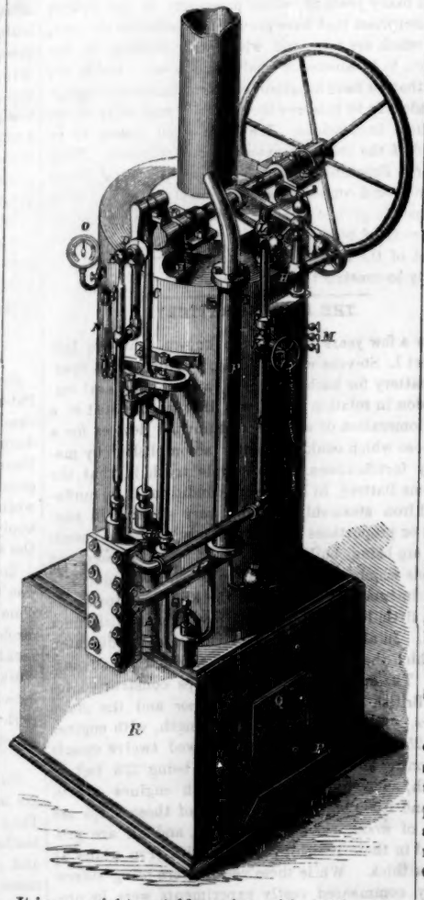
The patent for this invention was granted through the Scientific American Patent Agency to the inventors, R. A. Goodyear and L. A. Sprague, May 21, 1861, and for descriptive circulars or for any further information in relation to the matter, inquiries may be addressed to L. A. Sprague & Co., 208 Fourth street, Brooklyn (E. D.), N. Y.

Nickel—German Silver.

This is a metal about which few persons, comparatively speaking, know anything beyond its name. In appearance, pure nickel may readily be mistaken for silver, the sole difference being that the nickel is more inclined to grey. Nickel, as it usually comes into the market, is chiefly obtained from nickelliferous pyrites, and from a product obtained in treating cobalt, which is a somewhat similar metal. In this state, however, it would be altogether unfit for the manufacture of German silver. To obtain the pure metal the powdered cobalt speiss—for so the product alluded to is named—is roasted first alone and then with charcoal, to get rid of the arsenic which is always mixed with it. What remains is mixed with three parts sulphur and one part carbonate of potash, and the whole then fused in a large earthen crucible. The product is next purified with warm water, by which the arsenic and sulphur combined with the potash are dissolved, and sulphide of nickel—that is, sulphur and nickel mixed in equal proportions—remains at the bottom of the vessel which has been used. When all the arsenic has been removed the sulphide is again washed in warm water and treated with certain acids: it is ultimately made ready for use. This metal combined with copper and zinc forms German silver. The alloy is fashioned into the various articles with the greatest facility, and a small proportion of nickel mixed with iron, prevents the latter from rusting when exposed to the moist atmosphere. Could nickel be obtained at a low cost so as to admit of its being mixed with iron, it would prove of great advantage to the arts.

WALBRIDGE'S PORTABLE STEAM ENGINE.

The accompanying engraving represents a very neat portable engine, designed by A. S. Walbridge, foreman of Whittelsy's Foundry and Machine Manufactory at Malone, N. Y. No striking novelty is embraced in the engine, but we present it as an admirable design and arrangement of parts for that class of small engines that are used for driving piles, discharging cargo, and other operations in which a moderate power is required.



It is an upright portable engine, with cast-iron firebox, lined with firebrick; the boiler is tubular, with steam chamber; the cylinder, A, is bolted to the boiler with guides and crosshead attached; the shaft, B, runs across the top of the boiler, with belt wheel on one end and crank, eccentric and valve-rod guide over hang on the other end; C is the main connecting rod; D is the eccentric, attached by overhanging crank in line with the shaft; E is the guide for valve rod; F is steam or water heater; G is pump; H is governor; I is steam pipe; J is exhaust pipe; K is throttle valve; L is safety valve; M, gage cocks; N is water gage; O is steam gage; P is ash pit; Q is furnace door and R is the cast-iron firebox, forming a base on which all rest. It is seated on an iron basin containing about an inch of water, making it perfectly safe. A 6-horse power engine requires only thirty-two inches square of room, making it a very compact and durable engine for printers, farmers, planters and mechanics in general, where space is limited, and it requires very little fuel.

We are informed that one of these engines, occupying a space of thirty-two inches square has driven a line of shafting of one of Hoe & Co.'s large-sized country presses, not in labor or printing, and all its own machinery, with three pounds of steam, using only a cord of wood in from ten to fourteen days, being run every day. They are constructed to burn coal as well as wood.

Persons wishing to order one of these engines, or desiring any further information in relation to them may address C. C. Whittelsy at Malone, N. Y.

Metallic Veins.

Few metalliferous veins reach above eighteen hundred feet in depth or twelve hundred feet below the surface of the mountains in which they are situated. In general, veins continue in one direction, and are usually much inclined, always more so than beds. The metallic matter called ore rarely occupies the whole of the vein, but is disseminated through the quartz, granite, &c, which constitute the greater part of the vein, and is called the gangue, matrix or veinstone. Metallic veins are most numerous in primary and secondary rocks. They occur more frequently in flat, hilly country than in steep, mountainous country, and generally on the ridges of the hills. Beds, on the contrary, are more abundant in steep and mountainous country. As a general fact the veins are seldom rich near the surface, but increase in value at a medium depth, and grow poor again at a greater. They are most productive near the junction of stratified and unstratified rocks. Their productiveness also depends somewhat on their direction; an east and west direction being regarded in some mines as the most favorable, while the north and south veins are usually unproductive. Great metalliferous veins usually run parallel with the general direction of great valleys.

Removing Grease Spots.—A simple agent for removing grease spots from silk and woolen fabrics is very useful. Carbonate of magnesia, saturated with benzole, and spread upon a grease spot to about one-third of an inch in thickness, answers well for this purpose. A sheet of porous paper should be spread upon the benzonated magnesia, and a flat iron, moderately warm, put upon the top of all. The heat of the iron passes through and softens the grease, which is then absorbed by the porous magnesia. The flat iron may be removed in the space of one hour, and the magnesia dust brushed off. Soapstone dust may be used in the same manner, and answer nearly as good a purpose.

Cold Rolled Iron.—At a late meeting of the Manchester Literary and Philosophic Society Mr. Fairbairn stated that he had been making some experiments on the process of cold rolling as applied to iron. A plate of cold rolled iron from Earl Dudley sustained a pressure of 51.3 tuns on the square inch, and a cold rolled bar a pressure of 39,388 tuns on the inch. Cold rolling is about to be applied to railway rails.

The tungstate of soda is the best substance for rendering clothes incombustible when they are required to be ironed after washing. The sulphate of ammonia is equally as good respecting its non-combustible qualities, but the iron does not run so smoothly over clothes that are prepared with it.

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NEW YORK, SATURDAY, JANUARY 18, 1862.

RAILROADS IN THE UNITED STATES—WHAT THEY WILL DO TOWARD PAYING THE NATIONAL DEBT.

There are now in actual operation within the United States thirty-one thousand one hundred and sixty-nine miles of railroad. In 1831 there was not fifty-four miles of railway communication; five years later there was one thousand one hundred and two miles; and from that time to the present—during a period in which we have experienced financial difficulties of the most serious character—the number of railroads have increased to an extent which seems almost fabulous. During the whole period of thirty years we have added an average of more than one thousand miles of road for each year. In the decade just closed, the number of miles annually constructed has been about two thousand two hundred—the amount annually expended being $100,000,000. These facts give some idea of the material progress of the country, and of the value to the people at large of railway communication. They also evidence the skill and ingenuity of our mechanics and inventors, without whose aid these vast monuments of our wealth and civilization could never have been constructed. When we look back thirty years and realize what was then our condition, and compare it with our present resources, the increase seems beyond the bounds of possibility—more indeed than the most sanguine political philanthropist could ever have imagined.

It is true that some of the railroads which have been built have not paid the first cost of their construction; that stock dividends have often times been wanting, and consequently the stocks have depreciated in the market; but we know that the number of miles we have stated is in actual operation, and that railroads, unless indeed they are built in a wilderness, will pay a sum necessary to keep the road in actual employment. Leaving out of view, therefore, the value of the road itself, and the rolling stock, if we estimate the aggregate yearly expenditure necessary to keep these roads at work doing the business they have been doing in the last few years, we can form a rough estimate of their present yearly value to the people of the United States. For, as a general rule, neither railroad enterprises, nor any other enterprise, will be kept in operation for a long period unless it pays somebody; and if the community patronize an enterprise so that it is successful, we may safely calculate that the community secure an equivalent in value.

By the last annual report of the New York Central Railroad Company it appears that the company paid to its employees for their labor alone, during the year ending Sept. 30th, 1861, the sum of $1,062,694 05—the total sum expended in maintaining the road being $4,647,978 11. It thus cost the road, on the average, for labor, $1,906 09 per mile, and for labor and other expenses combined, $8,240 per mile.

If we estimate the cost of maintaining the entire length of the railroads in the United States by one-half of these sums, it is found that the aggregate sum of money paid annually for labor alone, by all of our companies combined, is $29,704,057, and the aggregate cost of maintaining the entire length of railways amounts to the sum of £120,944,780 annually.

We may then safely assume that the value of railroads to the people of the United States is equivalent to a yearly income of over $129,000,000. The increased value imparted to real estate situated along the line of the road, and the numerous other advantages which no figures can express, always resulting from the building and maintenance of a line of railroad, left are out of the calculation. And we think this sum, great as it appears, is yet far short of representing the real value of our system of railroads. But at this rate of developing wealth, how long will it take our railroads, unassisted by any other brances of industry, to pay the entire national debt? Supposing the national expenditures to reach the sum of $1,200,000,000, the railroads alone, supposing no increase in their business, would more than pay the entire indebtedness in one decade. But, during the last ten years, the railroads have more than tripled themselves in extent; in the year 1851 there being but eight thousand eight hundred and fifty-six miles of road in operation. Of the total length of road, the loyal States had six thousand eight hundred and sixty-eight miles in 1851; and they now have twenty-one thousand and forty miles—two-thirds of the whole being within loyal States.

The national debt which we are now contracting in order to suppress the rebellion which has unhappily broken out in the Southern States seems immense in its proportions. But when we consider its magnitude we must also consider the means we have at disposal to ultimately extinguish it. What we can do with ease to-day we could by no means have done twenty and thirty years ago. We make, through the ingenuity of our mechanics and inventors and the constant industry of our entire population, immense strides, every year, in national progress and wealth. There is no reason for allowing our spirits to become depressed, or for ceasing our usual industry. New efforts must be put forth, and new successes will assuredly follow. Far from feeling sad over our national trouble, we have reasons for rejoicing in the accumulated strength of so many years of public prosperity, in the success of enterprises that have proved themselves in the past, and which are now, and which will continue in the future, to be sources of wealth and power; and in the fact that we have an administration democratic enough to endeavor to preserve the integrity and unity of our political institutions. We have good reason to be proud of the immense extent of our railroads. They are iron ligaments which should be perpetual bonds of amity and confidence among ourselves. They utter a constant protest against disunion; and we should be proud of our railroads, but we should be more proud of the men who have had the genius and the ability to construct and to operate them.

THE STEVENS BATTERY.

For a few years it has been known that the late Robert L. Stevens was building, at Hoboken, a floating battery for harbor defense, and the general impression in relation to it was that it consisted of a conglomeration of strange and untried devices for a purpose which could be better accomplished by masonry fortifications. The simple truth is, that the Stevens Battery, in its present condition, is an unfinished iron steamship, varying very slightly in size, form or proportions from the six iron mail-clad vessels that are being built by the British government on models which are the result of elaborate and costly experiments. It varies from the English ships in being a little longer, a little narrower, and with finer lines. In all these respects it varies in the direction in which the naval architects of England are advancing. The first two iron-plated ships constructed for the British navy were the *Warrior* and the *Black Prince*. These were 380 feet in length, with engines of 1,250 horse power. Then followed twelve vessels of smaller size, a portion of them being 278 feet in length, and a portion 280 feet, with engines of 600, 860 and 1,000 horse power. Five of these ships are built of wood, the others of iron, and all are protected in their midship sections with iron plates 4½ inches thick. While these vessels were being successively commenced, costly experiments were in progress to test plates of various thicknesses with all the different kinds of artillery that could be procured. With the light of all this expensive information, and of the combined knowledge and skill of English naval architects and engineers, the latest decision of the Admiralty is to build six iron ships, 400 feet in length, to be furnished with engines of corresponding power, and to be protected by iron plates 5½ inches in thickness. The Stevens Battery is 420 feet long, her engines will yield 5,200-horse power, and her armor plates are 6¾ inches in thickness. Her beam is 53 feet, and she is sharper than any other ocean steamer, her lines being a shade finer than those of the *Great Eastern*.

There are several novel ideas in the plan of this ship, but none of them belong to that portion which has already been constructed. If our government desires to construct a vessel almost exactly like those which are being built for the English navy, they have only to erect a similar superstructure upon the unfinished hull of the Stevens Battery. A commission, consisting of Commodore S. H. Stringham, U. S. N.; Commander William Inman, U. S. N.; Captain Thomas A. Dornin, U. S. N.: Alban C. Stimers, Chief Engineer, U. S. N., and Professor Joseph Henry, of the Smithsonian Institute, was some time since appointed by the Navy Department to examine the battery, and they have, with the exception of Professor Henry, signed a report saying that they do not deem it expedient to complete the vessel upon the plans proposed by Mr. Stevens. It is very possible that this is a wise decision; but the government has expended $500,000 on the ship, and the propriety of finishing her upon some plan is certainly worthy of consideration.

Government will probably build 20 iron-plated war vessels. The construction of these requires not only a vast sum of money but also a great deal of time, which is quite as important in the present emergency. We have one great ship, half finished, upon which has been expended twenty months of vigorous labor and half a million of the nation's money, besides $228,000 advanced by Mr. Stevens out of his private funds. Our Navy Department should very maturely consider the matter before deciding to throw away all this time and money. We suggest that a new commission be appointed to consider the propriety of finishing this vessel upon some plan. Let it be composed of men familiar with the construction of iron ships, and who will inform themselves in regard to the art of building iron-plated vessels where this art has received its fullest development in England and France. In the plans proposed let those originally devised by Mr. Robert L. Stevens receive a thorough examination, and let Professor Henry be heard in relation to them.

We can see no reason why the Stevens Battery may not be finished in a way to make her the safest and best sea boat, the swiftest, the most manageable and altogether the most efficient and formidable of any iron-clad vessel in the world.

REVIVAL AT THE PATENT OFFICE.

Our Washington correspondent writes us that the Patent Office is rejoicing in a marked increase of business. The number of applications for patents filed during the month of December, exceeded those of November by more than one hundred. People are beginning to wake up to the fact that now is the time, while business is dull, and leisure time plenty, to apply their minds and search for choice treasures in the abundant realms of science and art.

To all of our readers, old men and young, we say, don't sit moping in a corner, nor idle your precious time away in foolish babbling around grocery-store circles, but seek continually for personal improvement; keep your mental powers industriously at work. Think, think, think; and at last success shall crown your efforts; some worthy improvement may perhaps reward your exertions, and prove of great benefit to you and your fellow men.

THE knapsacks of the French and German armies are made of calfskins, tanned with the hair left on. They shed the rain better than those formed of plain leather, and they are not so much affected with heat and cold as those made of water-proof fabrics, because the hair is a good non-conductor.

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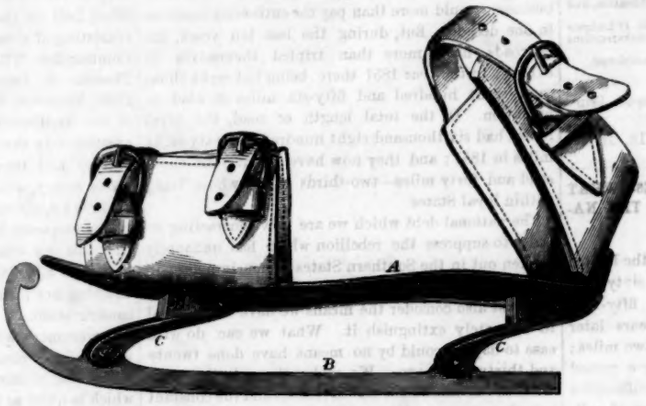
Improvement in Skates.

There has been no more impressive proof of the tendency of a demand for inventions to call them forth, than is furnished by the great number of improvements in skates that have resulted from the present extensive use of these articles. Among these improvements are several plans for making the skate easier to the foot by introducing springs into its construction. It is found in practice that the spring skate fatigues the foot if the spring yields at any time more at one end of the skate than at the other, and to obviate this objection is the principal aim of the invention here illustrated.

This skate is so constructed as to keep the runner, B, always parallel with the foot stand, A. To this end the levers, C C, are attached by pivots, *a a*, to the runner, and by pivots, *b b*, to the foot stand. The springs are wedges of india rubber, D D, inserted between the inclined levers, C C, and the foot stand, A. The levers are prevented from turning forward at their upper ends and thus allowing the runner to fall away from the foot stand, by the rear lever being carried above the pivot and brought against the end of the foot stand. By this arrangement, while all the advantages of the spring skate are secured, the runner is always kept perfectly parallel with the foot stand, thus preventing unequal strains upon different portions of the foot and producing a peculiarly easy and comfortable skate, as we can certify from personal trial.



GOODYEAR AND SPRAGUE'S SPRING SKATE.

The wearers of this improvement also enjoy an acceleration of speed in forward movements that cannot otherwise be realized. This superiority is especially noticeable when the ice is a little rough. The springs serve to allow the runners to mount and pass obstructions in an easy gliding manner, without those abrupt concussions which usually check the momentum of the skater. A gentleman of our acquaintance who uses these skates says that they are as good to him as the famed seven-league boots. Although he is by no means a fast skater they enable him, with the utmost ease, to outstrip all other competitors. This is upon roughened ice. Upon smooth ice he thinks that they also have an advantage in speed, though not in so marked a degree.

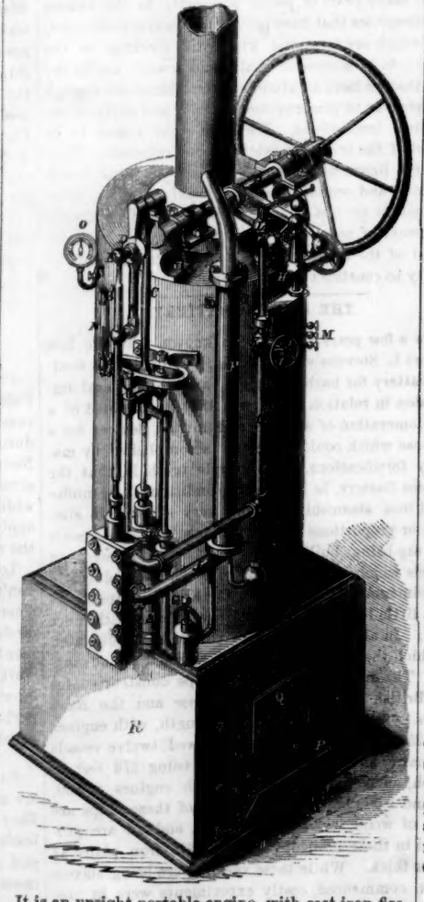
The patent for this invention was granted through the Scientific American Patent Agency to the inventors, R. A. Goodyear and L. A. Sprague, May 21, 1861, and for descriptive circulars or for any further information in relation to the matter, inquiries may be addressed to L. A. Sprague & Co., 208 Fourth street, Brooklyn (E. D.), N. Y.

Nickel—German Silver.

This is a metal about which few persons, comparatively speaking, know anything beyond its name. In appearance, pure nickel may readily be mistaken for silver, the sole difference being that the nickel is more inclined to grey. Nickel, as it usually comes into the market, is chiefly obtained from nickelliferous pyrites, and from a product obtained in treating cobalt, which is a somewhat similar metal. In this state, however, it would be altogether unfit for the manufacture of German silver. To obtain the pure metal the powdered cobalt speiss—for so the product alluded to is named—is roasted first alone and then with charcoal, to get rid of the arsenic which is always mixed with it. What remains is mixed with three parts sulphur and one part carbonate of potash, and the whole then fused in a large earthen crucible. The product is next purified with warm water, by which the arsenic and sulphur combined with the potash are dissolved, and sulphide of nickel—that is, sulphur and nickel mixed in equal proportions—remains at the bottom of the vessel which has been used. When all the arsenic has been removed the sulphide is again washed in warm water and treated with certain acids: it is ultimately made ready for use. This metal combined with copper and zinc forms German silver. The alloy is fashioned into the various articles with the greatest facility, and a small proportion of nickel mixed with iron, prevents the latter from rusting when exposed to the moist atmosphere. Could nickel be obtained at a low cost so as to admit of its being mixed with iron, it would prove of great advantage to the arts.

WALBRIDGE'S PORTABLE STEAM ENGINE.

The accompanying engraving represents a very neat portable engine, designed by A. S. Walbridge, foreman of Whittelsy's Foundry and Machine Manufactory at Malone, N. Y. No striking novelty is embraced in the engine, but we present it as an admirable design and arrangement of parts for that class of small engines that are used for driving piles, discharging cargo, and other operations in which a moderate power is required.



It is an upright portable engine, with cast-iron firebox, lined with firebrick; the boiler is tubular, with steam chamber; the cylinder, A, is bolted to the boiler with guides and crosshead attached; the shaft, B, runs across the top of the boiler, with belt wheel on one end and crank, eccentric and valve-rod guide over hang on the other end; C is the main connecting rod; D is the eccentric, attached by overhanging crank in line with the shaft; E is the guide for valve rod; F is steam or water heater; G is pump; H is governor; I is steam pipe; J is exhaust pipe; K is throttle valve; L is safety valve; M, gage cocks; N is water gage; O is steam gage; P is ash pit; Q is furnace door and R is the cast-iron firebox, forming a base on which all rest. It is seated on an iron basin containing about an inch of water, making it perfectly safe. A 6-horse power engine requires only thirty-two inches square of room, making it a very compact and durable engine for printers, farmers, planters and mechanics in general, where space is limited, and it requires very little fuel.

We are informed that one of these engines, occupying a space of thirty-two inches square has driven a line of shafting of one of Hoe & Co.'s large-sized country presses, not in labor or printing, and all its own machinery, with three pounds of steam, using only a cord of wood in from ten to fourteen days, being run every day. They are constructed to burn coal as well as wood.

Persons wishing to order one of these engines, or desiring any further information in relation to them may address C. C. Whittelsy at Malone, N. Y.

Metallic Veins.

Few metalliferous veins reach above eighteen hundred feet in depth or twelve hundred feet below the surface of the mountains in which they are situated. In general, veins continue in one direction, and are usually much inclined, always more so than beds. The metallic matter called ore rarely occupies the whole of the vein, but is disseminated through the quartz, granite, &c, which constitute the greater part of the vein, and is called the gangue, matrix or veinstone. Metallic veins are most numerous in primary and secondary rocks. They occur more frequently in flat, hilly country than in steep, mountainous country, and generally on the ridges of the hills. Beds, on the contrary, are more abundant in steep and mountainous country. As a general fact the veins are seldom rich near the surface, but increase in value at a medium depth, and grow poor again at a greater. They are most productive near the junction of stratified and unstratified rocks. Their productiveness also depends somewhat on their direction; an east and west direction being regarded in some mines as the most favorable, while the north and south veins are usually unproductive. Great metalliferous veins usually run parallel with the general direction of great valleys.

Removing Grease Spots.—A simple agent for removing grease spots from silk and woolen fabrics is very useful. Carbonate of magnesia, saturated with benzole, and spread upon a grease spot to about one-third of an inch in thickness, answers well for this purpose. A sheet of porous paper should be spread upon the benzonated magnesia, and a flat iron, moderately warm, put upon the top of all. The heat of the iron passes through and softens the grease, which is then absorbed by the porous magnesia. The flat iron may be removed in the space of one hour, and the magnesia dust brushed off. Soapstone dust may be used in the same manner, and answer nearly as good a purpose.

Cold Rolled Iron.—At a late meeting of the Manchester Literary and Philosophic Society Mr. Fairbairn stated that he had been making some experiments on the process of cold rolling as applied to iron. A plate of cold rolled iron from Earl Dudley sustained a pressure of 51.3 tuns on the square inch, and a cold rolled bar a pressure of 39,388 tuns on the inch. Cold rolling is about to be applied to railway rails.

The tungstate of soda is the best substance for rendering clothes incombustible when they are required to be ironed after washing. The sulphate of ammonia is equally as good respecting its non-combustible qualities, but the iron does not run so smoothly over clothes that are prepared with it.

Scientific American

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☞ See Prospectus on last page. No traveling agents employed.

VOL. VI. NO. 3.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, JANUARY 18, 1862.

RAILROADS IN THE UNITED STATES—WHAT THEY WILL DO TOWARD PAYING THE NATIONAL DEBT.

There are now in actual operation within the United States thirty-one thousand one hundred and sixty-nine miles of railroad. In 1831 there was not fifty-four miles of railway communication; five years later there was one thousand one hundred and two miles; and from that time to the present—during a period in which we have experienced financial difficulties of the most serious character—the number of railroads have increased to an extent which seems almost fabulous. During the whole period of thirty years we have added an average of more than one thousand miles of road for each year. In the decade just closed, the number of miles annually constructed has been about two thousand two hundred—the amount annually expended being $100,000,000. These facts give some idea of the material progress of the country, and of the value to the people at large of railway communication. They also evidence the skill and ingenuity of our mechanics and inventors, without whose aid these vast monuments of our wealth and civilization could never have been constructed. When we look back thirty years and realize what was then our condition, and compare it with our present resources, the increase seems beyond the bounds of possibility—more indeed than the most sanguine political philanthropist could ever have imagined.

It is true that some of the railroads which have been built have not paid the first cost of their construction; that stock dividends have often times been wanting, and consequently the stocks have depreciated in the market; but we know that the number of miles we have stated is in actual operation, and that railroads, unless indeed they are built in a wilderness, will pay a sum necessary to keep the road in actual employment. Leaving out of view, therefore, the value of the road itself, and the rolling stock, if we estimate the aggregate yearly expenditure necessary to keep these roads at work doing the business they have been doing in the last few years, we can form a rough estimate of their present yearly value to the people of the United States. For, as a general rule, neither railroad enterprises, nor any other enterprise, will be kept in operation for a long period unless it pays somebody; and if the community patronize an enterprise so that it is successful, we may safely calculate that the community secure an equivalent in value.

By the last annual report of the New York Central Railroad Company it appears that the company paid to its employees for their labor alone, during the year ending Sept. 30th, 1861, the sum of $1,062,694 05—the total sum expended in maintaining the road being $4,647,978 11. It thus cost the road, on the average, for labor, $1,906 09 per mile, and for labor and other expenses combined, $8,240 per mile.

If we estimate the cost of maintaining the entire length of the railroads in the United States by one-half of these sums, it is found that the aggregate sum of money paid annually for labor alone, by all of our companies combined, is $29,704,057, and the aggregate cost of maintaining the entire length of railways amounts to the sum of £120,944,730 annually.

We may then safely assume that the value of railroads to the people of the United States is equivalent to a yearly income of over $129,000,000. The increased value imparted to real estate situated along the line of the road, and the numerous other advantages which no figures can express, always resulting from the building and maintenance of a line of railroad, left are out of the calculation. And we think this sum, great as it appears, is yet far short of representing the real value of our system of railroads. But at this rate of developing wealth, how long will it take our railroads, unassisted by any other brances of industry, to pay the entire national debt? Supposing the national expenditures to reach the sum of $1,200,000,000, the railroads alone, supposing no increase in their business, would more than pay the entire indebtedness in one decade. But, during the last ten years, the railroads have more than tripled themselves in extent; in the year 1851 there being but eight thousand eight hundred and fifty-six miles of road in operation. Of the total length of road, the loyal States had six thousand eight hundred and sixty-eight miles in 1851; and they now have twenty-one thousand and forty miles—two-thirds of the whole being within loyal States.

The national debt which we are now contracting in order to suppress the rebellion which has unhappily broken out in the Southern States seems immense in its proportions. But when we consider its magnitude we must also consider the means we have at disposal to ultimately extinguish it. What we can do with ease to-day we could by no means have done twenty and thirty years ago. We make, through the ingenuity of our mechanics and inventors and the constant industry of our entire population, immense strides, every year, in national progress and wealth. There is no reason for allowing our spirits to become depressed, or for ceasing our usual industry. New efforts must be put forth, and new successes will assuredly follow. Far from feeling sad over our national trouble, we have reasons for rejoicing in the accumulated strength of so many years of public prosperity, in the success of enterprises that have proved themselves in the past, and which are now, and which will continue in the future, to be sources of wealth and power; and in the fact that we have an administration democratic enough to endeavor to preserve the integrity and unity of our political institutions. We have good reason to be proud of the immense extent of our railroads. They are iron ligaments which should be perpetual bonds of amity and confidence among ourselves. They utter a constant protest against disunion; and we should be proud of our railroads, but we should be more proud of the men who have had the genius and the ability to construct and to operate them.

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For a few years it has been known that the late Robert L. Stevens was building, at Hoboken, a floating battery for harbor defense, and the general impression in relation to it was that it consisted of a conglomeration of strange and untried devices for a purpose which could be better accomplished by masonry fortifications. The simple truth is, that the Stevens Battery, in its present condition, is an unfinished iron steamship, varying very slightly in size, form or proportions from the six iron mail-clad vessels that are being built by the British government on models which are the result of elaborate and costly experiments. It varies from the English ships in being a little longer, a little narrower, and with finer lines. In all these respects it varies in the direction in which the naval architects of England are advancing. The first two iron-plated ships constructed for the British navy were the *Warrior* and the *Black Prince*. These were 380 feet in length, with engines of 1,250 horse power. Then followed twelve vessels of smaller size, a portion of them being 273 feet in length, and a portion 280 feet, with engines of 600, 800 and 1,000 horse power. Five of these ships are built of wood, the others of iron, and all are protected in their midship sections with iron plates 4½ inches thick. While these vessels were being successively commenced, costly experiments were in progress to test plates of various thicknesses with all the different kinds of artillery that could be procured. With the light of all this expensive information, and of the combined knowledge and skill of English naval architects and engineers, the latest decision of the Admiralty is to build six iron ships, 400 feet in length, to be furnished with engines of corresponding power, and to be protected by iron plates 5½ inches in thickness. The Stevens Battery is 420 feet long, her engines will yield 5,200-horse power, and her armor plates are 6¾ inches in thickness. Her beam is 53 feet, and she is sharper than any other ocean steamer, her lines being a shade finer than those of the *Great Eastern*.

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THE NEW BUILDING FOR THE GREAT EXHIBITION.

An interesting paper on this subject was recently read before the Society of Arts, in London, by W. C. Phillpots. A large plot of ground was purchased last year, in South Kensington, for the purpose of constructing buildings for periodical exhibitions of industry, to be held at intervals of about ten years. The main building of the exhibition occupies an extent of sixteen acres of this ground. It is 1,200 feet long and 500 feet wide. Other buildings are being erected as wings and galleries, to afford an extent of 24½ acres for the exhibition. The new structure is stated to be superior to the old Crystal Palace, being more imposing in its interior, more suitable for exhibition purposes, and its outside aspect being one of impressive magnitude. Glass and iron are not the main features of the structure, as they were in the old one of 1851; the lofty walls are of brickwork, and the interior is divided into nave, transepts, aisles and open courts. The interior supports are hollow cast-iron columns one foot in diameter. They are arranged at intervals of 25 and 50 feet from center to center, and all the leading dimensions of the building are multiples of 25, excepting the nave and transepts, which are exceptions to this rule. The iron columns are supported differently from those of the Crystal Palace of 1851. These latter were attached to connecting pieces, each terminating in a large flat base plate which rested on concrete laid flush with the ground. The new columns are bedded on large slabs of stone laid on brick piers, which are founded on concrete. The slabs are all adjusted to the same level by varying the hight of the brickwork, so that all the columns used are of the same hight. The total area roofed in is 988,000 square feet; the space roofed in 1851 was only 799,000 feet. The space covered in by the Paris exhibition was 953,000 square feet. But in this instance more open space was used, because the climate of Paris is more favorable for out-door display than that of London. It was stated by Mr. Phillpots that much was learned by English architects from the exhibition buildings in Paris, so as to afford more convenience for superior display by the exhibitors.

The nave is 800 feet long 85 feet wide and 100 feet in hight. The supports on either side consist of round and square cast-iron columns coupled together. These columns are 50 feet high in two lengths of 25 feet each. From each end of the nave, and at right angles to it, run the two transepts 650 feet in length. In constructing the vast roof of the nave, an ingenious movable scaffold was used, which, although it weighed 87 tuns was moved on wheels by four men. The hoisting was executed by a winch worked by steam. This machine has two grooved cast-iron barrels revolved by toothed wheels operated by a portable steam engine. A rope passes round these grooves, and by means of snatch blocks and pulleys, ropes were led to all parts of the building, and the heaviest girders, columns, beams, &c., were all raised by it. Heavy floor girders, weighing one and a half tuns, were raised in two minutes, and the ponderous sides of the nave, weighing six and a half tuns, were raised in twenty minutes to their full hight. Two great domes are erected at the intersections of the nave and transepts. They are the largest that have ever been executed; each is 160 feet in exterior diameter. The celebrated dome of St. Peter's, at Rome, is 157½ feet; that of St. Paul's, in London, 112 feet. Their final hight, however, is not so great as that of the two famous cathedral domes, as they spring from a hight of 114 feet, and their final hight is but 260 feet, while the cross of St. Peter's is situated at 434 feet, and that of St. Paul's at 340 feet above the pavement. The quantities of materials used in its construction are 7,000,000 bricks, 4,000 tuns of cast iron and 1,200 tuns of wrought iron. No less than 820 twenty-five feet iron columns are used which, laid lengthwise, would extend four miles, and 1,266 girders laid in the same manner, would reach a distance of six miles. Upward of 1,300,000 square feet of flooring have to be laid; in covering the roofs 486,386 square feet (eleven acres) of felt have been used, and 553,000 square feet of glass, weighing 247 tuns, and covering twelve and three-quarters acres are required for the glazing. The galleries and exhibition apartments are laid out in a style for room, convenience and display far surpassing those of any former exhibition. The entire cost is to be only $1,000,000.

A FRIENDLY WORD FROM ENGLAND.

We have never read anything with more satisfaction than the following remarks from the *Mechanics' Magazine*. This publication is the oldest one of its character in England, and we suppose in the world. It is now in its Seventy-fifth volume, and we take the extract from the 2,001st. number. It has always sustained a high position, and is regarded as sound on all questions of mechanism, philosophy and science. We can assure our cotemporary that its friendly feelings toward this country are fully reciprocated by the great mass of our people, as was most completely demonstrated at the time of the great Indian rebellion:—

Science for years past has been making memorable progress in America, and particularly in the Northern States. In fact, almost all the literary and scientific names of note of that continent have sprung from the North. The Southern States have produced little worthy of record or admiration; and we must say that we have been surprised and pained at the sympathy which some of the statesmen and many of the journals of this country have recently expressed for the South at the expense of the North. At the present moment, a serious dispute exists between England and the Federal States. The merits of that dispute is a province on which we shall not enter. We do not however, anticipate a war, as we consider there is sufficient good feeling and common sense on both sides of the Atlantic to prevent such a catastrophe. May the time never come when the voice of reason and humanity will be drowned amid preparations for slaughter. A war between America and England would be a blow in the face of civilization itself, for which no naval or military victories however achieved, or by whomever won, would be sufficient to atone.

We have also received a recent copy of the *Daily Post*, published in Bristol, England, containing a full report of a lecture delivered in that ancient city by John Cassell, Esq., the eminent publisher in London. Mr. Cassell spent nearly one year in this country studying our institutions, and the lecture to which we now refer fully shows that he carried home none of those miserable prejudices which are so often shown by returned European travelers. The lecture is a grateful tribute to the industry, energy and honor of our people.

THE NATIONAL QUARTERLY REVIEW.

Of all the thousand ways a man may spend his money, there is certainly no other so sure of proving a wise outlay as the subscribing for a good periodical publication. If pleasure is his object, here he has it of the purest and highest character and in the largest abundance. The pleasure, too, is lasting. It is not transitory like the pleasures of sense, but endures through life, increasing the happiness of all our subsequent existence. If a man is seeking safe and profitable investments, let him devote a portion of his property to enriching his mind. This mental wealth cannot be lost by easy endorsements or unwise speculations, but is certain, in spite of storms at sea, or fires on land, or any commercial disaster, to be a man's own as long as he lives.

We have been impressed with these thoughts in reading an article on the Koran in the *National Quarterly Review*. The writer had examined his subject, and in a few sentences he gives the reader a distinct idea of the character of the Koran. He says that it seems to have been formed of a number of romances torn into fragments and then the fragments thrown together without any order. It seemed to us that we would not part with this bit of information in regard to a work occupying so large a space in the mind of the world as the Koran for the price of a year's subscription to the *National Review*. And yet this was only a small part of one article in one number. All the ideas and facts contained in the four numbers would be worth many times their cost; and the same may be said of almost any other publication of any character. We are constantly receiving statements from our subscribers of some fact or hint in the SCIENTIFIC AMERICAN having realized to them all the way from a few dollars up to independent fortunes. We doubt whether any man ever subscribed for a good publication without coming to the conclusion that it was worth to him many fold the amount of its cost. The taking of one publication tends to induce a person to take another, and the most intelligent portions of a community purchase the largest number of books and periodicals.

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ANNEALING STEEL AND HARDENING DENTAL INSTRUMENTS.

An article in the Philadelphia *Dental Cosmos*, on the above subject, by Dr. Buckingham, contains some useful information. In reference to annealing small pieces of steel for the purpose of softening them to be easily worked, he states that the best method of doing this is to take a metallic tube, either of brass or iron, about three-fourths of an inch in diameter and three inches long; fill it with powdered charcoal, then push the steel into it, then lay the tube on a piece of charcoal and raise it with the blowpipe to a full red heat. It is now allowed to cool in the air, and the point of the steel is found to be as soft as it can readily be made. In this way Dr. Buckingham has annealed very fine broaches for removing nerves, and he has made them as soft and pliable as the best annealed wire. The charcoal prevents the pieces of steel from oxidizing, and there is no danger of overheating. When annealed, the steel points are formed into proper shape and are then fit to be hardened. This is done by heating them to a certain temperature judged by the color, which is usually described as "cherry red." An important point to be considered is the degree of heat which produces this color. This depends upon the light in which they are heated. If the operation is conducted in a dark room, of course the steel appears red-hot at a much lower temperature than when heated in daylight. According to Sir Humphrey Davy's experiments, bodies begin to appear luminous when heated to 810° in a dark place; a dull red visible in daylight is about 1,000°—a difference of 190°.

Alcohol, oil or gas is used to heat dental instruments; the difference of light given out by these agents is always taken into consideration. Alcohol gives very little light but emits a high heat when burning. Brande, in his "Manual of Chemistry," states that the degree of hardness attainable by steel depends upon the temperature to which it has been raised, and the cold to which it is subjected afterward. The higher the heat of the article, and the lower the cold of the cooling medium, the harder will be the steel. A steel article heated to a dull red color should be plunged into water of 34° temperature; an article heated to a cherry-red, plunged into water at 50°; heated to an orange red, into water of 80°, and to a dull white into water of 100° Fah. The steel is tempered after being hardened by heating it to a lower point, then cooling it in the manner described in articles on this subject in Vol. V., new series SCIENTIFIC AMERICAN.

EXPERIMENTS IN RELATION TO THE STEVENS BATTERY.

On the 4th inst. a large number of distinguished gentlemen, officers of the army, navy, &c., were invited to witness some experiments intended to test some questions in relation to the Stevens Floating Battery. A target was constructed similar to the plates intended to be made for her armor, and placed at the same angle at which they will lie upon the ship. It was formed of boiler plates bolted together to a thickness of 6¼ inches, and placed at an angle of one foot vertical to two feet horizontal. This was fired at from a distance of 200 yards with a round shot from a 10-inch service gun with 11 pounds of powder, and with an elongated shot from a 6-inch rifled Parrot gun. The shot glanced from the plate; a result fully anticipated by every one acquainted with the present state of knowledge in regard to the resistance of inclined plates. The 10-inch gun was loaded by steam, and the recoil was taken up by india rubber springs. This portion of the experiment was very interesting, and we shall give next week a full account of it, with an illustration of the apparatus employed.

EIGHT HUNDRED MILLION DOLLARS COINED.—The mints of the United States have coined since they commenced operations—a period less than seventy years—the large amount of eight hundred millions of dollars—about one-fifth of the whole metallic currency of the world. Of this amount five hundred and twenty millions of dollars were derived from the mines of the United States.

STEAM BOILERS IN CITIES.

The Board of Police Commissioners, of this city, in their annual report, present some startling facts, which deserve the instant attention of the community, and which call for legislative action. With respect to steam boilers, used in the city, it says :—"The practice of employing unskillful men, and in some instances, women and boys as engineers, is so general as to counteract in some degree the public benefits resulting from the examination of boilers, by the Police Board. It is respectfully submitted, that persons in the cities of New York and Brooklyn, acting as engineers shall be required to obtain certificates from the Board of Police—such certificates to be granted on evidence of competency, and without the payment of fees."

No one certainly can object to this recommendation. None but competent persons should be employed to attend steam boilers. We advocated this inspection system for boilers many years before it was adopted, and with it we recommended an examining and licensing system for engineers. After fair trial of the inspection law it has been found to operate very well, but it wants the addition we formerly advocated, and now recommend, to make it more perfect.

Last year 2,566 steam boilers were tested by the hydraulic pump in New York, and 567 in Brooklyn. No less than 654 were found to be defective, and were repaired and remedied by order of the Board. A number of explosions were undoubtedly prevented by this inspection.

REPORT ON THE STEVENS BATTERY.

The Commission appointed by the Navy Department to examine the Stevens Floating Battery have made two reports, one signed by all of the members except Professor Henry, against completing the vessel, and a minority report by Professor Henry in favor of completing her. Professor Henry says that he will give the reasons for his opinion if they are desired. We suppose, of course, that they will be called for, and when they appear we shall have some remarks to make in regard to both reports. We have doubts about the practicability of one or two of Mr. Stevens's plans, as we have about all mechanical devises before they are tried, but there is not one of those proposed for the battery which we should not like to see tested.

Ginning Sea Island Cotton.

The cargo of cotton received at this port by the steamer *Vanderbilt*, from Port Royal, requires ginning, and although no orders have been received from the government have been received at the office of the Quartermaster's Department, it is probable a wide discretion will be allowed the authorities here in its disposal. Since the first arrival a wonderful degree of activity has been displayed by the dealers in cotton, who are anxious to get the job of ginning. One feature of the ginning business is, that although very few persons have had any experience, each claims that he is able to do the work much better than any of the others—and one man has actually undertaken to do a portion of the labor without compensation, for the purpose of demonstrating his ability. He is to return not only all the cotton he take but the seed. More than fifty different persons have applied in relation to this matter. The pressure continues. Some of these men, it is understood, have undertaken the construction of ginning mills in the expectation that by having the machinery in readiness the cotton will be likely to find its way into their hands.

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Steam on Steep Roads.

The London *Mining Journal* contains some very interesting remarks on this subject. It says :—

A new description of traction engine, constructed on the principle that when working the weight of the engine and of the load in the carriages is transferable at will to the fore part of their respective wheels, has been invented and provisionally protected by Mr. John Marshall, C. E. With this engine it is intended to place shoes, or the endless railway, under each wheel of both engine and carriages. It gives the maximum of tractive power to be obtained from a given diameter of cylinders and steam pressure, and Mr. Marshall maintains that it will prove most economical for haulage purposes. Each shoe forming the endless railway presents a bearing surface of six square feet to each driving wheel, so that it would pass over not only bad roads without destroying them by slipping or sinking, but it would also cross with equal ease plowed lands, bogs or sandy deserts, and, by the very principle of its construction, ascend any hill, taking a load after it, calculated not from the rate of inclination, but from the horse power exerted where it did not slide bodily backward, in fact, any inclination on which a balk of timber would not slide.

From the principle of the endless railway, as applied to traction engines, the heaviest of them cannot damage the road, but will rather compress and solidify it by a steady downward pressure. Mr. McAdam, Surveyor General of turnpike roads, in his evidence before the Select Committee in 1859, says :—"I do not think, if you were to travel with one of these engines over 100 miles, you could say that these shoes had worn the road." The result of a series of experiments, conducted at the instance of the government, on engines constructed with Boydell's shoes, and under most severe tests, gives the cost of haulage at a fraction less than 3d. per tun per mile. In the principle of Marshall's engine, as regards the mode of applying the power to the wheels, the invention is as much superior to the present construction as Boydell's invention of the endless railway was to its predecessors in that respect. The Locomotive Act, 1861, forbidding the use of projections on the wheels, leaves only the selection between cylindrical smooth-soled wheels and shoes. Cylindrical wheels smooth-soled seem to have failed; there is, therefore, no choice left but to adopt the shoe, with which, and an engine built upon the principle of Mr. Marshall's invention, ordinary difficulties may be overcome to an extent that is now considered impossible. It is proposed to form a company to construct an engine and train of carriages on this principle, to be capable of ascending to the steep mountain mines with a heavy load; and on its success being fully established to extend the capital and powers of the company to undertake the construction of engines and carriages on this principle, either to be sold or let for hire, or to carry at a price per tun per mile. The advantages of this system of traction is strongly urged upon mine and quarry owners to open up mines and quarries that are now almost worthless.

The Sick Letter Writer.

Mr. Russell, the special correspondent of the London *Times*, is sick in this city with typhoid fever. Russell is sick! Well, we don't wonder. When he first landed in this country he was most cordially welcomed. He proceeded South, and commenced a series of letters on the state of the country, which have attracted much attention. We were always disposed to give him the credit of being an impartial writer, but his more recent efforts fasten conviction upon every candid mind, that he is an enemy of the country, and has used his powers to destroy us. In a recent letter he declares that we are controlled by a mob, and that our government would be broken up if Mason and Slidell were surrendered. We should think Russell would be sick, and heartily ashamed of his conduct toward us in this trying emergency. "Oh! you can't succeed," is the cry which has been ringing from certain foreigners of the Russell ilk ever since the war broke out. Our disposition to try has been scouted and ridiculed by them in the most wanton manner.

HEATING CITY CARS—The city railroad cars in Lynn, Mass., are now heated underneath the floor, and are thus made warm and comfortable. This matter is worthy the attention of all city car companies.

Criticism on Steam Experiments.

In the last volume SCIENTIFIC AMERICAN, page 281, we noticed and quoted part of the criticism of Mr. McElroy, on the well-known experiments made at Erie by United States Engineers. To this criticism Alban S. Stimers, Chief Engineer U. S. Navy, one of the experimenters, has replied in the *Journal of the Franklin Institute*. He states that Mr. McElroy has failed to perceive "the real matter which the experiments were intended to assist engineers in deciding;" also, that he has labored under a misconception of what the conditions are in an engine, "the change of which will effect the economic result," and that he also fails to comprehend the simplest requirements and to perceive that most of his objections are answered in the report of the engineers appointed to conduct the experiments. Mr. Stimers was a strong believer himself in the benefits of cut-offs and working steam expansively before the Erie experiments were made. These made him a convert; an impartial opinion from him, therefore, may be expected. Mr. McElroy stated that the real matter at issue was, "whether it is cheaper to carry high steam and expand, or to carry low steam and follow full stroke." Mr. Stimers states that the experiments were not instituted to ascertain the economy of using steam of different pressures, "but the relative economy of using steam with different measures of expansion."

This is not a clear statement of the matter at issue, according to our reading of the report. It is true the report states that the experiments were undertaken to test "the true practical relative economy of various measures of expansion;" but it just as clearly states that these experiments determined the futility of using steam expansively under all pressure—high and low. The advantages of high pressure steam are acknowledged, but only when used at its maximum pressure in the cylinder. The whole controversy lies in a nutshell. Is it economical, under any conditions, to use steam without expansion in cylinders for all kinds of work? If so, what style of engines should be used? These are important questions for the engineering world. If smaller cylinders can be used for engines working steam at full stroke, with as much economy of fuel as large cylinders in which steam is used expansively, it is absurd to use cut-offs and expanded steam. The public desires more extensive practical information on this subject.

Rensselaer Polytechnic Institute—Military Education.

This is one of the best scientific institutions in the United States. It was founded in Troy, New York, in 1824, by the Hon. Stephen Van Rensselaer, as a school of theoretical and practical science, and since it was founded it has sent forth some of the ablest professors and teachers of the physical sciences that this country has produced. Mathematics, and engineering in its various branches, chemistry and geology have been taught in it with great success, and recently the Board of Trustees have established a course of instruction in military science under the charge of a competent graduate of the U. S. Military Academy. The course embraces the following subjects :—1. Use of Small Arms; 2. Tactics of Artillery and Infantry. 3. Theory of Ordnance and Gunnery; 4. Military Engineering and Science of War.

THE Niagara (N. Y.) *Herald* makes the following complimentary allusion to the SCIENTIFIC AMERICAN, for which the editor has our thanks :—

There is but one opinion among all classes as to the merits of this journal (SCIENTIFIC AMERICAN), and we might go on enumerating reasons therefor. One is, the quotations made from it by all the newspapers of the country; its decree upon scientific matters being considered as "official." Another one to be cited, and which is the subject of remark everywhere, is the artistic excellence of its engravings; in proof of which we refer our readers to an engraving of an improved "Wheeler & Wilson" sewing machine in the last number. So perfect is it, that you can almost imagine it ticking off the stitches.

COTTON FROM PERU.—The British steamer *Callao*, at Panama, from Valparaiso, brought up a large quantity of cotton from Peru—consigned to England—with the announcement that a much larger amount is going round Cape Horn. This cotton is said to be of superior quality and no efforts to raise a very large crop on the Peruvian coast, the ensuing year, will be spared. The present price of cotton is bringing it forward from a number of places not usually distinguished as sources of supply of this article.

IMPROVEMENTS IN IRON AND STEEL.

The readers of the SCIENTIFIC AMERICAN will recollect that in a late number an appeal was made to the inventors of the country showing the importance of the discovery of some process which would reduce bar iron and steel to the same cost as cast iron, thereby simplifying the present complicated and expensive modes of working. Our attention has been called to a new process which seems to be a step in the right direction. Marcus Lane, of Washington, D. C., has recently taken out two patents, Nos. 2,086 and 2,945, for improvements in the manufacture of steel and iron.

Mr. Lane at first, we understand, devoted much time to an examination of the English process of making steel and the various processes which have been used as improvements to the same, as well as an investigation of the chemical principles which have produced the various changes. Mr. Lane's process consists in a carbonization of bar iron. In order to accomplish this so that the steel shall be homogeneous in tenacity and malleability, a long and carefully-guarded heating of the metal in close contact with carbon is necessary. This can only be done at considerable expense; and although many and various are the substances which have been invented and used in place of charcoal to carbonize the iron, as before stated, they necessarily require so much careful attention and such an outlay of money as to considerably increase the cost of the steel over the cost of of bar iron; beside, the first step taken must be to manufacture bar iron before the process for manufacturing steel can be commenced.

Having become satisfied that the desired object could never be accomplished by improvements upon the English process, Mr. Lane took up the German process and the two patents above mentioned are the results of his study.

The reader will bear in mind that steel occupies an intermediate position between cast iron, which is an impure carbonized iron, and bar iron, which is a nearly pure decarbonized iron; the cast iron having 5 per cent or more of carbon, steel having from 1 to $1\frac{15}{100}$ths per cent, while bar iron has only about $\frac{50}{100}$ths of 1 per cent. Now, if this process can be stopped when the metal is decarbonized to $1\frac{1}{2}$ per cent, or to nearly that degree, steel will be the product.

The aim of the German process is to stop at this point, and it is evident that if the article produced was as pure as that produced by the English process, it would supersede the latter in general use, as it is produced as cheaply as bar iron, and therefore avoids the expense of further manipulations. But it has been found that steel thus produced contains impurities which existed in the ore before it was fused, and which could not be driven off without further manipulations. It is evident, therefore, that if these impurities can be removed this process will at once come into general use. Mr. Lane has aimed at accomplishing this result, but it it remains to be fully tested by practical experiments to demonstrate whether he has succeeded.

The common mode of manufacturing iron from the ore is as follows:—The ore is first fused and run off into pigs; the pigs are then taken and re-smelted, by which means the impurities of the metal are driven off, and afterward passed through the rollers or into the puddling furnace.

The first improvement which Mr. Lane has endeavored to make was the avoidance of the necessity of re-smelting the metal, and thus make the bar iron at one fusion. In order to accomplish this it was necessary to so improve the process as to compensate for the beneficial changes produced by the re-smelting. This compensation of the beneficial effects of the re-smelting is made by supplying carbon in the necessary quantities and continuing the intense heat until the iron is made nearly pure. The effects of the re-smelting are owing to the fact that the carbon and the oxygen operate to drive off the impurities in the form of vapor. Of course, it is apparent that a continuance of the supply of oxygen to the fused metal with an abundant supply of carbon will have a similar effect. At the same time it was necessary to bring this process completely under the control of the operator, and leave no part of the manipulations subject to mere chance. It was also necessary that the improved process should be so controlled as to make the changes effected the same throughout the whole mass, and thus render the product of equal tenacity and malleability. Mr. Lane accomplishes this by the following improved process:—

He runs the fused metal from the smelting furnace directly into a refining furnace which is so placed that the gravity of the metal, as it enters the chamber, gives it a circular or rotary motion. This motion is continued by means of agents introduced at a tangent to the mass of metal which also operate to rapidly decarbonize the same. But it has been found by actual experiment that such decarbonization is too rapid to permit the heat evolved to carry off the detrimental impurities existing in the metal, and the result is that the iron produced is found to be brittle and almost valueless. To obviate this imperfection, Mr. Lane introduces carbon in such quantity and quality as may be found necessary, and thus prevents any real decarbonization unless desired, or delays the same until the injurious impurities have been removed by means of the intense heat created by the union of the carbon and the decarbonizing agents in the refining furnace. The following description of the mode of working is taken from Mr. Lane's specification:—

The carbon is drawn into the vortex or eddy produced by the rotation, and sinking with the metal to the bottom of the refining chamber, is, by the subsequent motion of the metal, diffused through its whole mass—the motion of the rotation being such, by the means I employ, as to cause the metal at the bottom to pass to the sides of the refining chamber, thence up the sides of said chamber to the surface, and thence down again to the bottom of the refining chamber—the horizontal rotary motion—the ascent and descent of the metal creating the vortex or eddy into which the carbon is injected, and so in the first instance brought in contact with the surface of the metal, and by the repeated motions of the metal, as above described, finally permeated throughout its whole mass.

Our readers will readily understand that any change thus effected must be uniform and homogeneous. It is also evident that by the introduction of the carbon in greater or less quantities the operator has a perfect control of the fused metal, and can decarbonize the same as rapidly or as slowly as he may see fit.

Mr. Lane also introduces certain chemical compounds which operate to facilitate this process by removing the impurities in the form of slag; a full description of which is contained in the specifications.

Mr. Lane also connects the refining chamber with the smelting furnace in such way that the flue from the same enters the furnace in the form of an additional tuyere, through which the heated gases operate as a hot blast to facilitate the fusion of the ores. It is anticipated that this introduction will effect a great saving in the quantity of coal used.

Mr. Lane appears to have advanced in the right direction, and should his process prove as successful as it promises the following benefits will be derived:—

1. A better article of cast iron, for by his process he will be able to remove those impurities which at present make it so brittle.

2. The production of bar iron and steel nearly as cheaply as cast iron is produced at present.

3. The production of large masses of steel of uniform tenacity, density and strength which certainly cannot be accomplished by the present process save at a very heavy outlay.

4. The placing of molten metal at the perfect control of the operator as to purity, &c.

We have thus endeavored to explain the fundamental principles which are sought to be worked out in this new process, but have omitted many of the details of the invention, having only given those which were necessary in order that our readers might be able to understand it. We shall watch the future developments of this invention with much interest. Particulars, &c., relative to the invention may be ascertained by addressing the inventor as above.

NOTES ON FOREIGN INVENTIONS AND DISCOVERIES.

Wire Lathing for Walls.—W. E. Gedge, of London, England, has secured a patent for the employment of iron wires as a substitute for wood laths used on the walls of rooms that require plastering. The wires are stretched and crossed on the studs and joists and then secured in screw rings. The wires are fixed at such a distance apart that the priming coat of thick plaster mixed with hair will adhere to them perfectly. These wires do not shrink nor warp like laths, and on this account they are said to be superior for plastered walls.

Spinning Flyers.—B. Collingham, of Keighly, England, has taken out a patent for inserting glass or porcelain in the eyes of flyers, to prevent them from being cut by the rubbing action of the threads which pass through them.

Spinning Stop Motion.—To machines for doubling and twisting yarn W. and J. Kay, of Bolton-le-Moors, have applied a useful improvement to arrest the yarn or thread when it breaks between the rollers and the bobbin in which it is to be wound. The yarn passes over a rail and under the weighted end of a tumbler-lever. The other end of this lever is held in position by the yarn, consequently as long as the yarn passes forward to the bobbin, the weighted end of the lever is held above the rail, but as soon as the yarn breaks, the lever changes its position and the yarn is caught between the lever and the rail. The lever is so accurately balanced that if a single thread passes between the rollers, instead of a double yarn, the single yarn being too weak to hold the lever down, the weighted end drops and stops the supply until the yarn is mended.

New Elastic Webbing.—H. Turner and T. Yates, of Leicester, weave elastic webbing composed of silk, cotton and india rubber threads as follows:—Two sheds are opened at once on the same side of the india rubber warp threads, and in the lower shed a thread of cotton is shot, and a silk thread in the shed above, to form the face of the fabric. In this manner a very cheap silk-faced elastic webbing is produced.

Boiler Furnaces.—D. K. Clark, London, the distinguished writer on railway subjects, has obtained a patent for constructing boiler furnaces to consume the smoke when bituminous coal is used. Jets of steam are admitted to the furnace at its upper part over the door. A partition plate is fixed below the steam jets in such a manner that any air admitted below it will be prevented from rising to the top of the furnace till it passes beyond this plate, which protrudes some distance into the furnace. The jets of steam excite the draft, and assist to promote more perfect combustion of the fuel.

Wet Spinning.—S. C. Lister and J. Warburton, of Bradford, England, use a sizing trough combined with a cop frame, for spinning, and doubling and twisting yarn. The yarn is first passed through the size box, thence to the cop frame, where it is spun. This mode of sizing and wet spinning cotton is said to produce superior yarn. It is also well adapted to flax, which requires to be wet for spinning. The cops are made of brass or galvanized iron, to resist the rusting action of the water. In the old method of dry spinning tinned iron is employed for cops.

Alloy to Resist Vegetable Acids.—M. A. F. Mennom, of Paris, France, proposes a new alloy for this purpose, consisting of nickel, 55 parts; regulus of antimony, 50 parts; bismuth, 20; banca tin, 875.

RECENT AMERICAN INVENTIONS.

Reflectors for Gas Lights.—This invention has for its object the reflecting or the throwing down the light from gas jets, in such a manner that the goods in a store window, or any article on which the light is thrown, will be exhibited or shown in the most perfect manner—the light irradiating a space or area extending over the whole surface occupied by the goods or other articles, while the eyes of the spectators are perfectly shielded from the light. This valuable invention is due to Isaac P. Frink, of Newark, N. J.

Ordnance Projectiles.—This invention consists in the employment of an expanding tube of wrought or malleable iron copper or other suitable tough or tenacious metal, in combination with a leaden or other soft metal band applied to the exterior of a projectile, the former lining the said band and serving to attach it permanently to the head or body of the projectile and prevent its being loosened or flying off therefrom. It also consists in a certain mode of making a permanent connection between the cast-iron head or body and base piece of an expanding projectile by means of an expanding ring of soft metal. The invention is secured to Charles H. Sayre, of Utica, N. Y.

PHILADELPHIA VOLUNTEER REFRESHMENT SALOON.—The people, especially the ladies, of Philadelphia, deserve great credit for their kindness and attention in providing and supplying refreshments to all the volunteer regiments which passed through their city in 1861. From May 27th to December 28th, they entertained with bounteous refreshments 143,414 soldiers.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING DECEMBER 24, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

NOTE.—The following list of claims is the balance of the issue for December 24th, the first portion of which appeared in our last number.

3,020.—J. A. de Brame (assignor to himself and Jeremiah Gurney), of New York City, for Improvement in Revolving Ordnance :

I claim the combination of the screw, F, constructed as set forth, so as to serve as nipple vent and cylinder presser, with the frame, A, and revolving chamber, C, all as set forth.

I also claim the combination of the perforated disk, G, with the said screw, F, frame, A, and cylinder, C, as set forth.

[This invention consists in combining with the frame which contains the cylinder and carries the barrel, and on which are the trunnions of a revolving cannon, a screw so applied to screw through the said frame in rear of the cylinder and with its axis in line with the axis of the bore of the barrel, that it serves to press the cylinder directly up toward the barrel to make a tight joint between them, and, in case of the chambers of the cylinder being bored through its rear, to close and constitute a breech to the chamber, in line with the barrel.]

3,021.—J. A. de Brame (assignor to himself and Jeremiah Gurney), of New York City, for Improvement in Breech-Loading Ordnance :

First, I claim the axis pin, a, having a shoulder, r, and fitted to the cylinder frame, F, and rotating many-chambered cylinder, substantially as described, and furnished with a screw thread, receiving a nut, M, applied in rear of the cylinder frame, to operate substantially as set forth, for the purpose of making a tight joint between the open rears of the chambers and a breech formed by the rear end of the cylinder frame.

Second, The combination with the rotating many-chambered cylinder, H, of the ring, N, the lever, O, the spring tooth, W, and the stop pin, Z, said tooth and pin operating in combination with notches, y y, in the cylinder, substantially as and for the purpose specified.

[This invention consists in a certain mode of applying a rotating, many-chambered cylinder, in combination with the carriage, and with a fixed barrel, and in certain means of rotating the said cylinder to bring the several chambers successively in line with the barrel.]

3,022.—B. A. Mann (assignor to Jedediah Wilcox and H. H. Miller), of West Meriden, Conn., for Improvement in Machines for Clasping Hoops to Ladies' Skirts :

First, I claim the inclined hopper, F, and feeding plate, G, when arranged so as to be adjusted by the rods, D I, and used in connection with a clinching device, for the purpose set forth.

Second, The bars, i j, placed obliquely on the feeding plate, G, provided with grooves, l, and used in connection with the slot or opening, p, substantially as and for the purpose set forth.

Third, The passage way for the clasps, K, formed of the plates, m m, attached to the head or bar, H, and groove, n, made therein, when said passage way is used in combination with the feeding plate, G, and the clinching device, and arranged therewith, as and for the purpose specified.

Fourth, The clinching device, formed of the plate, J, attached to lever, B, or its equivalent, and provided with the ledge, w, having a concave or grooved upper surface, in combination with the clasp sustaining plates, I I, attached to the head or barrel, H, and arranged in relation with the plates, m m, and groove, n, substantially as and for the purpose set forth.

[The object of this invention is to obtain a machine by which the hoops of ladies' skirts may be rapidly clasped to the tapes thereof, and the work performed in a superior manner. It consists in the employment or use of a hopper and feeding plate, the latter being peculiarly constructed, and used in connection with a clinching mechanism, all being so arranged that the clasps, as the machine is operated, will be fed down in a proper manner to the clinching device, which is operated by the foot of the attendant, and made to perform the desired work, the parts to be connected, the hoops and tapes being presented to the machine by the hands of the attendant.]

3,023.—Conrad Marquardt (assignor to M. L. Marquardt), of Rhineback, N. Y., for Improvement in Whiffletree Attachment :

I claim attaching or connecting the whiffletrees, D D, to the double tree, A, by means of the links, E E, racks, B B, and the spring, F F, arranged substantially as set forth.

[This invention relates to a novel means employed for attaching the whiffletrees to the doubletree, whereby the whiffletrees may be readily adjusted on the doubletree, nearer to or further from its bolt, and the draft regulated for either horse, as occasion may require.]

3,024.—J. F. Leitch (assignor to O. D. Carter), of Green N. Y., for Improved Fan Blower :

I claim the circumscribed fan-room scroll air passage and wind cut-off, all in combination, as and for the purpose specified.

3,025.—R. B. Pullan (assignor to J. D. Pullan), of Cincinnati, Ohio, for Improvement in Lamps :

I claim the making of the double concentric tube, a b, constituting the inner and outer walls of air passage, e, by striking it up from a single plate of sheet metal, in the manner described.

I also claim the combination of the bayonet catch, F, with the arm, f, of the traveling nub, d, both as a fastening for the wick tube and as a means of raising and lowering the wick, substantially as described.

3,026.—E. D. Rosecrans (assignor to himself, J. S. Hull and Nelson Gates), of Cincinnati, Ohio, for Improvement in Lamps :

I claim the employment of atmospheric pressure upon the surface of the fluid in the reservoir, x x, by means of the air pump, w w′, when used with the tubes, o o f f, and valve at d′, in a lamp, substantially as described. I claim the air pump, w w′, when used in combination with the reservoir, x x, filling tube, p, and escape tube, r, in the manner and for the purposes substantially as set forth. I claim the employment of the burner and heater, when constructed with curved wings, b b, as described, when used with the tube, a, having an opening, a, in the manner substantially as set forth.

3,027.—C. H. Sayre (assignor to himself and C. E. Barnard), of Utica, N. Y., for Improvement in Projectiles for Rifled Ordnance :

I claim the employment, in combination with a leaden or other soft metal band, applied to a cast-iron projectile, of a lining tube, b, of wrought or malleable iron or other suitable tough or tenacious metal, attaching the said band to the head or body of the projectile, in the manner substantially as specified.

3,028.—Thomas Shaw (assignor to himself and B. Hart), of Philadelphia, Pa., for Improvement in Revolving Firearms :

I claim the combination of the pall, G, with the arm, K, substantially as described and for the purpose set forth.

3,029.—Joseph Young (assignor to J. B. and J. Young), of Varick, N. Y., for Improvement in Machines for Removing the Husks from Corn :

I claim the combination of the cutting apparatus with the fan blast and separator, arranged and operating substantially as and for the purpose set forth.

3,030.—Edwin Corner, of Columbus, Ohio, for Improvement in Beehives :

I claim hinging the comb frames in steps, so that the several frames may be swung open at the same time, as described, in combination with the hinged door and stationary central frame, substantially as and for the purpose specified.

3,031.—John Dean, of Worcester, Mass., for Improvement in Mats for Daguerreotypes, &c.:

I claim forming from sheets of metal mats, with their corners clipped or cut off, and finishing the said corners so as to conform with the outer bevel, and to form supports for sustaining the said mats upon the photograph or other plates, in the manner and for the purposes set forth.

3,032.—G. F. Holland, of Leominster, Mass., for Improvement in Mode of Attaching Breeching to Shafts of Carriages :

I claim the particular combination and arrangement described, the same consisting of a spring clutch attached to the harness, and a fixed stud or standard permanently affixed to the shaft, the two operating together, substantially as described.

3,033.—G. W. Keene, of Lynn, Mass., for Improvement in Heels for Boots and Shoes :

I claim, as an article of manufacture, a heel formed of successive rises, united by nails, which are driven and clinched at the time the heel is compressed, as set forth.

3,034.—Robert Kershaw, of Philadelphia, Pa., for Improvement in Gig Mills :

I claim, as an improvement on James Shaw's patent of Aug. 28, 1860, raising a nap on textile fabrics, by means of two or more card rollers, the latter being caused to revolve at such a speed, and the fabric being so guided by plain rollers that an alternate slackening and tightening of the said fabric will take place, thereby causing the wires of the rollers to penetrate the fibers, and effectually raise the desired nap.

3,035.—J. O. Doris, of Philadelphia, Pa., for Improvement in Fertilizers :

I claim the improved fertilizing compound, composed of coal ashes, animal manure, animal matter and vegetable matter, such as named, in the manner and the proportions specified.

3,036.—Sylvanus Sawyer, of Fitchburg, Mass., for Improved Fuse Hood for Shells :

I claim the employment of a hood or other equivalent device, in combination with a fuse, substantially in the manner and for the purpose described.

3,037.—Sylvanus Sawyer, of Fitchburg, Mass., for Improvement in Mandril for Loading Case Shot, &c.:

I claim, first, The loading mandril, constructed substantially as described, as an instrument for loading ordnance shells, or any other analagous use.

Second, The employment, in combination with the loading mandril, of a case or sheath, substantially as described.

3,038.—N. W. Spaulding, of San Francisco, Cal., for Improvement in Saw Gummers :

I claim, first, Pivoting or hinging the double-edged punch to the double-edged die, as recited, whereby the double shear cut may be made by the gummer.

Second, I claim, in combination with the double-edged die the double seed punch, as described, whereby the one end may be substituted for the other, as and for the purpose described.

3,039.—T. W. Adams (assignor to himself and C. H. Slicer), of Baltimore, Md., for Improvement in Men's Hats :

I claim, in the construction of men's hats, when the brims are of flexible or yielding material, giving the front and side curve to the brim, by means of a frame of cane, metal or other material, confined within or attached to the brim, at or near its circumference, substantially as and for the purpose set forth.

I claim, in combination with a hat brim, constructed as claimed in the preceding clause, the head band, O, for the purpose of preserving the symmetry of the body of the hat, substantially as described.

3,040.—R. N. Eagle, of U. S. Army, for improvement in Saddles :

I claim attaching the stirrups to a saddle by variable points of suspension, in the manner explained, or in any other manner, substantially equivalent.

EXTENSION.

5,399.—J. F. Winslow, of Troy, N. Y., for Improvement in Rolling and Compressing Puddler's Balls. Patented Dec. 18, 1847 :

I claim the method, substantially as described, of compressing or shingling puddler's balls or loops of iron into blooms, by the combination of the cam-formed compresser and two or more rollers, substantially as described.

Second, I claim the spring or yielding cheeks for setting up the ends of the blooms, in combination with the combined cam-formed compresser and rollers, substantially as described.

And, finally, I claim the feeder and discharging follower, in combination with the combined cam-formed compresser and rollers, in the manner and for the purpose described.

RE-ISSUES.

144.—A. A. Hotchkiss (administrator of Andrew Hotchkiss, deceased), of Sharon, Conn., for an Improvement in Projectiles for Rifled Ordnance. Patented Oct. 16, 1855. Re-issued July 2, 1861 :

I claim, first, Constructing a projectile in three parts, one of them of flexible or plastic material in the form of a ring interposed between the other two parts, formed of a harder material and so arranged that in the act of loading or firing, or of both, the resistance or the explosive effect of the powder, acting on a larger sectional area of the part, E, than the section of the ring, C, shall cause the latter to be so expanded or distended that it shall take the impression of the grooves, and be made to fit the bore of the gun, as described.

Second, Locking or securing the expansive material to the body of an expansive projectile by means of one or more lips or projections extending outward from the body of the shot into corresponding recesses in the expansive material, as at i, or of one or more grooves or recesses in the body receive internal lips or projections from the expansive material, as at e or e′.

Third, The tail piece for securing the cap to the body of the shot, and as a guide to the cap in its forward motion, in the manner described.

145.—C. M. Wilkins, of West Andover, Ohio, for an Improvement in Cheese Vats. Patented Nov. 22, 1859 :

I claim, first, The arrangement of the pipe, W, heater, F, and chamber, L, substantially as and for the purpose specified.

I claim, second, The combination of the valve, N, arm, M, to which it is attached, and the lever, B, arranged for operating substantially as shown, and for the purpose described.

I claim, third, Arranging either or both the valves, N and O, in combination with their respective pipes over the firebox of the heater, substantially as and for the purpose specified.

I claim, fourth, The use of the truss braces, J J J, in the manner and for the purpose described and shown.

146.—I. P. Frink, of Newark, N. J., for an Improvement in Reflectors. Patented April 17, 1860 :

I claim, first, The employment of an oblong pyramidal reflector, lined with glass or other diaphanuous material, substantially as shown and described.

Second, The combination of the cover, B, with a pyramidal reflector, substantially as shown and described.

Third, The combination of the hinged adjustable section, C, with a pyramidal reflector, substantially as shown and described.

Fourth, The combination of the beads, b b′, with a pyramidal reflector, substantially as shown and described.

Fifth, The combination of the cover, B, and hinged, adjustable section, C, with a pyramidal reflector, with or without the beads, b b′, substantially as shown and described.

147.—Cyrenus Wheeler, Jr., of Poplar Ridge, N. Y., assignee of R. T. Osgood, of Orland, Maine, for an Improvement in Grain and Grass Harvesters. Patented Feb. 17, 1852 :

First, I claim two independent driving and supporting wheels on a common axle, carrying a rectangular main frame located between said wheels, and suspended from and nearly balanced on said axle, in combination with the cutting apparatus hinged to said main frame, substantially as described.

Also, Balancing the main frame, and mounting the two driving and one main gear wheel on a common axle, in combination with a ratchet wheel for each driving wheel rigidly affixed to the axle, each driving wheel carrying a pawl that will stand in gear with its ratchet wheel when the machine is advanced, and out of gear when the machine is backed, substantially as set forth and described.

Also, The down hangers, as points of attachment for the hinges, and to bring the hinges below the main frame, substantially as described.

Also, Arranging the hinges by which the finger beam is connected to the main frame and thus advanced over the ground, on opposite sides of the center of motion, and at opposite ends of the main frame, substantially as and for the purpose set forth.

Also, Giving the hinges, by the finger beam is thus connected and advanced over the ground, a common center or axis of motion, though located at opposite ends of the main frame, substantially as described.

Also, So connecting the cutters with the crank that four vibrations of the cutters will be given for every single revolution of the crank, substantially as described.

Also, In combination with the two independent driving wheels, and a hinged cutting apparatus, a balance wheel, to equalize the motions of the cutters, and give steadiness of motion to the gearing, substantially as described.

Also, The combination, in a harvesting machine, substantially as described, of a hinged tongue, the main frame, two main supporting wheels, and the hinged cutting apparatus for the purpose set forth.

Also, In combination with a finger beam, an adjustable sole, substantially as described.

Also, In combination with a finger beam, and an adjustable sole, a lever, so arranged that the driver can by it, when in his seat, and with the machine in motion, raise or depress the cutting apparatus at pleasure, substantially as and for the purpose described.

148.—Cyrenus Wheeler, Jr., of Poplar Ridge, N. Y., assignee of R. T. Osgood, of Orland, Maine, for an Improvement in Grain and Grass Harvesters. Patented Feb. 17, 1852 :

I claim, first, The combination with the main frame of two independent driving wheels, and a hinged cutting apparatus, whereby the cutters are kept in operation, when the machine is turned either to the right or left, and the cutting apparatus, or either end thereof, is free to conform to the inequalities of the ground, independent of the up and down motions of the driving wheels, substantially as described.

Second, The combination in a mowing machine, in the manner set forth, of the following elements, viz., A hinged tongue to draw and steady the machine, a frame to carry and support the driver and gearing, two independent driving and supporting wheels to carry the frame and give motion to the cutters, and a short finger bar so hinged to the main frame that its progressive movement over the ground will be controlled by the main frame, and the upward and downward movements of the entire finger beam, or of either end thereof independent of the other end, by the undulations of the ground over which it is drawn, substantially as described.

Third, Arranging the hinges, by which the finger beam is connected to the main frame, and advanced over the ground, above the plane of cutters, substantially as and for the purpose described.

Fourth, In combination with the main frame and finger beam, so arranging the coupling arm, Y, that while that end carrying the beam can be brought close to, so as to permit the finger beam to travel on the ground, its other end, together with the hinges, will be carried above the ground, and free of obstructions, substantially as described.

Fifth, In combination with the main frame, and its supporting wheels, the hinged cutting apparatus located on one side of the center of motion, and the gearing, located on the opposite side thereof, substantially as and for the purpose set forth.

Sixth, In combination with the main frame, mounted on two independent driving and supporting wheels and a hinged cutting apparatus connected with the said main frame, a seat for the driver, so located that the cutters will travel in advance of the driver, substantially as and for the purpose set forth.

149.—Cyrenus Wheeler, Jr., of Poplar Ridge, N. Y., assignee of R. T. Osgood, of Orland, Maine, for an Improvement in Grain and Grass Harvesters. Patented Feb. 17, 1852 :

I claim, first, A hinged finger beam, so connected to or with the main frame, that while it receives its advancing movements from the main frame, it will in its upward and downward movements conform to the surface of the ground over which it passes, substantially as set forth.

Second, In combination with the main frame and finger beam, the intermediate hinged coupling arm, whereby the progressive movements of the finger beam and cutters shall be controlled by the main frame, while in their upward and downward movements they may conform to the undulations of the ground over which they pass.

Third, The short finger beam in combination with the intermediate hinged coupling arm, substantially as described.

DESIGN.

142.—Thomas Lyons, of New Britain, Conn., assignor to Russell and Erwin, Manufacturing Co., of New York City, for Design for a Horse Spur.

enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention. If susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co., No. 37 Park-row, New York.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of the case, inclosing the official letters, &c.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

New Publications.

BLACKWOOD'S MAGAZINE. Published by Leonard Scott & Co., No. 54 Gold street, New York.

The last number of this Tory but able monthly contains several admirable essays and narratives. Two papers, one entitled "A Month with the Rebels;" the other "Some Account of Both Sides in the American War," are one sided. The author of "A Month with the Rebels" is a simpleton.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper w n he time for which it was pre-paid has expired.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application at this office. Address MUNN & CO.,
No. 37 Park-row, New York.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of our reception of their funds.

Notes and Queries

F. M., of Ill.—We do not discover any novelty in your plan of a water wheel. Movable buckets are found in several models at the Patent Office. Your description is very meager and we may not have got a correct idea of your improvement. We would therefore suggest that you send us either a model of it or a sketch and description for further examination.

C. W. S., of Cal.—Your improvement in steam carriages, seems to be substantially like the one described in No. 17, Vol. V. If you wish to claim the invention, the only course left for you to pursue, is to apply for a patent, and contest before the Patent Office in due form the question of priority of invention. We have mailed to you one of our pamphlets of advice. On page 10 you will find remarks about interfering applications. Several directions how to proceed you will find on pages 5 and 6.

T. S., of Pa.—The tendency of a rifle shot to diverge from its initial direction is well known. As a general law the divergence is in the direction in which the upper side of the shot is moving in the rotation.

W., of N. Y.—All writers on optics state that a double convex lens causes the rays of light passing through it to converge, and makes the image of an object seen through it to appear larger than the object.

Caloric, of N. Y.—Fire is heat and light produced by the chemical combination of two substances, generally the combination of oxygen with some combustible substance. The old phlogiston theory has long been abandoned. It is now generally supposed that light, heat, electricity, and magnetism, are vibrations in some ethereal medium, analagous to the vibrations in the air which are called sound.

J. D., of Pa.—Allotropic phosphorus, is produced by distilling common phosphorus, under certain conditions, at a temperature not exceeding 450° Fah. It be comes converted into a brick-red substance, which will not ignite by common exposure to the air. This change in the property of phosphorus is due to molecular arrangement entirely, not a change of chemical composition. It is much less dangerous than common phosphorus, and yet when mixed with the common ingredients of lucifer matches, it ignites readily by friction.

A. L. I., of Va.—A solution of india rubber, applied to leggins, will render them water-proof, but this will become sticky in warm weather. Nothing but vulcanized india-rubber cloth is suitable for making water-proof clothing. The sulphide of carbon removes stickiness from common india rubber, when applied as varnish.

G. F. C., of Mass.—We have seen statements to the effect that the Armstrong guns had a range of five miles, but we believe they would produce very little damage at a distance of 3,000 yards.

J. V. A., of Vt.—The gray mineral, which you have sent us is gneiss, the black is schorl (tourmaline), the third appears to be the glass slag of a blast furnace. Beautiful red specimens of schorl, have been obtained at Paris, Maine; in color and luster they resemble rubies.

F. F., of N. Y.—Theoretically, the average pressure of steam in the cylinder of your engine, carrying 50 lbs. initial pressure and cutting off at two thirds of the stroke, is 44.44 lbs.

C. S., of N. Y.—Burnt shells and burnt limestone are far superior to unburnt ground shells and limestone, as fertilizing agents. The way to use slacked lime on land is to spread it broad cast on the surface, then plow it under.

A. C. B., of Ohio.—We are not acquainted with any manufacturer, who uses oakum and tow in the production of compressed gun wads.

M. C. B., of Ill.—According to our observations on trees, the limbs never ascend on the trunks. Thus if a limb shoots out from the trunk at three feet from the root, it ever remains at this distance from it.

C. T., of N. Y.—Cast iron chimneys, do not attract lightning. Iron is a good conductor of electricity; therefore, if you put up iron chimneys on your house, we advise you to connect them with the moist earth by iron rods. Do not put a layer of bricks on the top of each, as you propose, because this would prove more injurious than beneficial.

G. H. A., of Ohio.—We are not acquainted with the price of "Spenser's repeating rifle." A brief description of it will be found on page 371, Vol. V, and it will be fully illustrated next week.

T. J. P., of N. H.—Most of the ebony keys of piano fortes are oiled and rubbed up with pumice stone and whiting. To put a highly polished surface on them, however, they should receive several coats of varnish, and be rubbed down with pumice stone, and tripoli, or whiting, for the finishing operations. Hard wood is dyed jet black to resemble ebony, with a strong warm solution of logwood and the acetate of iron.

I. A. H., of Wis.—Water wheels do not run faster during night than day. An erroneous notion on this subject is rather wide spread, but you will find it fully exploded on page 207, Vol. I. new series SCIENTIFIC AMERICAN.

P.D., of N.Y.,—Asks the following: "If I contract with B, to manufacture his patented machine in a certain territory, at an agreed per cent, and A infringes by manufacturing and selling in said territory, without consent of B, can I prosecute A and recover damages? If not can I recover of B, or compel B to prosecute A?" Ans.—All depends upon your contract with A. If you purchased from him the exclusive right to manufacture and sell them, you can stop any one else from doing so. If you only obtained a personal right then you cannot trouble infringers of the patent, nor can you compel A to sue them.

H. C. B.—Wishes to correspond with some large broom manufacturing establishment with a view of furnishing a supply of turned broom handles. Address P. M., Brush's Mills, Franklin Co., N. Y.

W. P. M., of Ohio.—Joseph Dodin & Co., 22 Duane street, New York city, have a patent on a hemmer such as you describe, and are engaged in their manufacture. We believe they are made adjustable for different widths, at any rate they can be made so for two or more widths.

J.B. P.,of Mass.—You ask, "Will the magnetic needle which points to the North in the northern hemisphere, when taken into the southern hemisphere, turn round and point to the South?" Ans.—It will not.

F. T., of Min.—In the beautiful French system of weights and measures, the *metre*, is the measure of length; it is 39 371-1000 inches in length. The weight of pure water equal to the cube of the hundredth part of the *metre* of the temperature of melted ice forms the *gramme*, the standard of weight. It is equal to 5,548 drachms avoirdupois, or 15.4441 grains troy. A nautical mile is 1-60th of a degree of latitude; it is about 2,025 yards. Boyer defines *prestige*, as delusion, imposture, deceit; but it is generally used in English composition to express the impression already produced. John Wiley, No. 56 Walker street, has just issued an elementary work on drawings, by S. E. Warren, which we can recommend.

F. H. C., of Ohio.—The best cement known to us for uniting the bone ferrules of musical instruments, is a strong solution of white glue, mixed with some fine chalk.

C. K., of Pa.—You can magnetize a piece of steel in three ways, viz., by the current of a galvanic battery, by the current of a magneto-electric machine, and by rubbing it with a permanent magnet. The only way to determine its power of attraction, is by experiment.

E. C., of N. Y.—We are not acquainted with the composition of the so-called "amalgam bells," and do not know whether they are as durable as the common bronze bell. They are cheaper, but we do not like their sound so well.

L. K., of Ohio.—A patent was obtained January 27, 1843, by E. G. Woodman, of Lowell, Mass., for constructing portable cast iron forts. They were to be composed of rectangular cast iron blocks, made with rebates and flanges to fit into one another. The roof was to be of arched plates supported on iron pillars. Cast-iron blocks, twelve inches in thickness, if thoroughly annealed, may make a good shot-proof fort, but we would prefer five-inch wrought iron plates, as cast iron, in general, is very brittle.

W. S. P., of N. Y.—The wide flat bore for fire arms, is an old contrivance and not now patentable. You must try again.

A. S. Y., of N. Y.—The only way known to us for opening the closed pores of an earthenware vessel, that has been used for filtering purposes, is by washing it well with hot soap suds.

A. H. S., of N. Y.—A patent was taken out in March, 1843, by E. K. Root, and assigned to the Collinsville Company, for tempering articles of steel in a bath of heated air—an oven. This method of tempering axes is still practiced at the Collinsville Works.

J.A. M., of Conn.—The suspension bridge at Pesth, Hungary, which was erected by W. T. Clark, and completed in 1849, had a clean water way of 1,250 feet. The center opening was 670 feet, and the hight of the towers was 200 feet above the foundation. Its total weight was 1,300 tuns, and the cost was about $3,200,000.

W. O. S., of Mass.—The shining of rotten wood is called phosphorescence, from the Greek *phos*, light, and *phero*, to bring Though a vast number of facts in relation to the phosphorescence various substances has been collected, the subject is still involved in mystery. It is considered probable, however, that the shining of rotting wood is due to the absorption of oxygen, which is a slow combustion.

H. S., of Pa.—Paper is not made from wood, at present, in any establishment known to us. By reducing several kinds of wood, such as larch into fine shavings, and subjecting them to hot alkaline solutions, paper pulp can be made in the same manner that straw pulp is made, but the cost is greater. We will give your invention attention when the model is sent. We have not the information desired respecting the high-pressure engines which you have described.

J. F. T., of Mass.—You inquire, "What is the best substance to place under paper that is to be cut by a sharp die, to prevent the edges becoming ragged?" We have not had personal experience in this line, but a block of lead, or very soft copper, covered with parchment, or leather, or vulcanized india rubber, we think, would answer well.

H. W., of Minn.—We do not believe that any American butter is adulterated with lard; but in London it is common to adulterate butter with the drippings of beef fat and lard.

T. J., of Pa.—Fourteen pounds of water may be evaporated by one pound of coal in a boiler of the best construction.

J. H. W., of Md.—A small portion of chromium alloyed with steel is said to improve its ductibility.

Money Received

At the Scientific American Office on account of Patent Office business, during one week preceding Wednesday, Jan. 8, 1862:—

P. F., of Vt., $25; J. E., of N. Y., $50; L. U. S., of N. Y., $15; G. and P., of Ill., $25; O. S., of Vt., 10; D. G., of N. Y., $15; L. E. O., of Conn., $15; E. T., of Mass., $25; M. S., of N. Y., $45; J. F. B., of Conn., $30; J. H. of N. Y., $20; J. H. B., of N. Y., $40; C. B. H., of Mass., $15; A. B., of Mich., $20; J. L. T., of N. Y., $15; F. B. S., of N. J., $600; F. A. B., of N. Y., $25; J. D. McP., of Cal., $25; C. W. H., of N. Y., $15; G. P. and W., of Ill., $15; T. C. R., of Wis., $25; S. D. K., of N. Y., $20; E. H. and D. W. R. W., of Iowa, $55; T. B., of Mass., $20; B. S. and J. M., of Pa., $15; M. B. T., of Mass., $25; J. B. G., of Mich., $20; G. P. T., of Mass., $25; J. A. W., of O., $25; W. A. P., of Cal., $30; A. McG., of N. Y., $15; C. E. B., of Conn., $30; W. M., of Mass., $15; J. B., of Vt., $45; M. B., of N. Y., $20.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Jan. 1 to Wednesday Jan. 8 1862:—

J. H. B., of N. Y.; P. F., of Vt.; J. B. G., of Mich.; M. B. T., of Vt.; G. & P., of Ill.; T. C. R., of Wis.; E. T., of Mass.; F. A. B., of N. Y.; J. A. W., of O.; H. & P., of Pa.; J. C., of Mass.

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NEW YORK OBSERVER FOR 1862.—IN ASKING the aid of all who may desire to extend the circulation of the *New York Observer*, it is proper for us to state distinctly the position it occupies with reference to the present condition of public affairs in our beloved country.

Having always maintained the duty of good citizens in all parts of the land to stand by the Constitution, in its spirit and letter, when that Constitution was assailed and its overthrow attempted, we accordingly at once gave a cordial support to the Government in its patriotic endeavor to assert its lawful authority over the whole land. Believing secession to be rebellion, and when attempted, as in this case, without adequate reasons, to be the highest crime, we hold

1. That the war was forced upon us by the unjustifiable rebellion of the seceding States.

2. That the Government, as the ordinance of God, must put down rebellion and uphold the Constitution in its integrity.

3. That every citizen is bound to support the Government under which he lives, in the struggle to reestablish its authority over the whole country.

4. That the Constitution of the United States is the supreme law of the Government as well as of the people; that the war should be prosecuted solely to uphold the Constitution and in strict subordination to its provisions: and the war should be arrested, and peace concluded, just so soon as the people now in revolt will lay down their arms and submit to the Constitution and laws of the land.

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The state of the country renders it important for us and estimable for the churches, that a new and earnest effort be made to extend the principles of good government and sound religious truth into all the families of the land. In every neighborhood there must be some who do not now take a religious newspaper, and who might with a little exertion be induced to subscribe.

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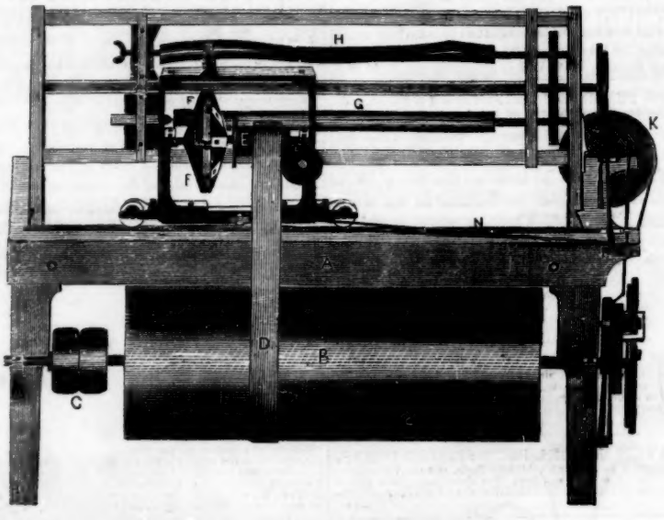
Expiration of Blanchard's Patent.

It has been justly and generally acknowledged that America excels all the other nations in her superior machinery for working in wood. Mr. Joseph Whitworth, F. R. S., Commissioner to the World's Fair held in New York in 1853, in his report on the manufactures of the United States, says, "In no branch of manufacture does the application of labor-saving machinery produce by simple means more important results than in the working of wood. As wood is obtained in America in any quantity it is there applied to every possible purpose, and its manufacture has received that attention which its importance deserves." To Mr. Thomas Blanchard, of Boston, we are indebted for one of the most original machines and greatest improvements ever devised for working in wood, and in the production of irregular forms by self-acting—automatic—movements. This invention has revolutionized the entire art, operations and mechanism for turning axe helves, gun stocks, shoe lasts, &c., and such machines are now employed in all the armories of every government in Europe, as well as those in the United States. No machine is better known, or has been in years past the subject of more frequent litigation, and at the present moment it is invested with a peculiar interest, as the extended patent for it will expire and become public property two days after the date of this issue of the Scientific American—on January 20, 1862. The accompanying illustration is a side elevation of this machine, applied to the turning of axe helves, after the description of which we will follow with a brief biography of the inventor and a history of the patent.



LATHE FOR TURNING IRREGULAR FORMS.

A is the frame, B is a large drum, C is a driver pulley, D is a band which passes from the drum over a pulley, E, and drives its rotary cutter wheel, F F. This cutter wheel is fixed on an axis in a small sliding frame, which moves from one end to the other of the lathe, by a cord, N, winding upon a spindle lying across the machine, which cannot, therefore, be seen, but which is driven by a large pulley, K, thus giving it a requisite slow motion. H is the pattern axe helve, and G the rough material, to be cut exactly like H. The pattern and rough material are placed in the lathe—represented by the upright frame—and sustained by spindles. On the back part of the machine there is a curious but beautiful sliding rest, which is the subject of a patent in itself. It moves along after the cutter wheel, and has two plane faces on which the pattern and cut helve rest. The pattern and helve roll upon the planes, while the rest has a rocking motion, which accommodates itself to all the uneven turning of the patterns, &c., as they revolve. For turning long articles, this rest is a beautiful and positively necessary part of the machine. To turn a *fac simile* of any pattern, it will be evident to every mechanic that if a pattern be placed in a lathe, and the material to be turned be placed with its axis of rotation similar to that of the pattern, and if a guide pressing on the pattern directs a wheel with cutters to operate on the rough material over a surface like the pattern, upon a rail, and it is pressed out and in, according to the shape of the pattern, by the upper guide, and the cutter wheel being directed in the same manner thus cuts the pattern on the rough material. The strap, D, is retained in its proper place by a grooved pulley on the cutter frame, and the whole kept firm and snug to the work to be turned.

Thomas Blanchard, the inventor of this ingenious mechanism, was born in Sutton, Mass., June 24, 1788, and, from a strong inclination for mechanical pursuits, he joined his brother at an early age, and engaged in the manufacture of tacks by hand labor. The slow and tedious operation of making tacks by hand incited him to devise a machine when he was only 18 years of age to make tacks by the power of steam or water, and he succeeded so well that his machine made 500 tacks per minute, with better heads and points than were ever made by hand at the rate of only two per minute. Some years after this Mr. Blanchard heard that various abortive attempts had been made to construct a self-acting machine at the United States Armory, at Springfield, for turning gun barrels with a uniform finish. He undertook to produce such a lathe and was perfectly successful. When it was first put in operation all the workmen assembled to see it, and were astonished at its precision, one of the grinders remarking that his "occupation was gone." Another operative, being more confident in the difficulties of his craft and the skill required to make gun stocks, said to Blanchard, who was present, he "could not spoil his job." The inventor hesitated a moment, and answered, he "had not thought about it, but he was not sure that a machine could not be invented to turn such irregular work," and that he would give the subject attention. That evening, while riding home through the town of Brimfield, Mass., he worked out the problem, and the above lathe for turning irregular forms, as applied to gun stocks, was devised, a model completed at an early date afterward, and a patent for it secured on the 6th of September, 1819. This patent was afterward cancelled on account of a defective specification. Letters Patent were re-issued on the 20th of January, 1820, for fourteen years from that date. By a special act of Congress the patent was again extended for fourteen years from January 20, 1834, and again extended for fourteen years by a similar bill in 1848, which act expires by limitation on the 20th of this month. It is now nearly forty-three years since this invention was first patented; it has been twice extended by Congress, and has been longer in existance than any other patent known to us. It is on this, as well as other considerations, surrounded with more interest, perhaps, than any patent ever issued. It is not our purpose to allude in detail to the expensive litigations which have arisen from this patent; but a few years ago they occupied as much attention from the Supreme Court as the famous Woodworth planing machine patent. Mr. Thomas Blanchard resides at present in Boston, in the enjoyment of vigorous old age, and the blessings and comforts arising from his meritorious inventions and a temperate and industrious life. Beside being the inventor of this original machine for turning irregular forms, he has taken out at least twenty-four patents for other inventions and improvements, and has an application now pending before the Patent Office for a very useful invention, the specification and drawings for which were prepared at this office. He has been a benefactor to his country and fellow man by his many useful inventions, for which he has never been over-rewarded.

FROM THE STEAM PRESS OF JOHN A. GRAY.